European Site Conservation Objectives: Supplementary advice on conserving and restoring site features

The Lizard Special Area of Conservation (SAC)
Site code: UK0012799

The Lizard Peninsula, Cornwall ©Peter Wakely/Natural England

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About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to The Lizard SAC. This advice should therefore be read together with the SAC Conservation Objectives available here.

Where this site overlaps with other European Sites, you should also refer to the separate European Site Conservation Objectives and Supplementary Advice (where available) provided for those sites.

You should use the Conservation Objectives, this Supplementary Advice and any case-specific advice given by Natural England, when developing, proposing or assessing an activity, plan or project that may affect this site.

This Supplementary Advice to the Conservation Objectives presents attributes which are ecological characteristics of the designated species and habitats within a site. The listed attributes are considered to be those that best describe the site's ecological integrity and which, if safeguarded, will enable achievement of the Conservation Objectives. Each attribute has a target which is either quantified or qualitative depending on the available evidence. The target identifies as far as possible the desired state to be achieved for the attribute.

The tables provided below bring together the findings of the best available scientific evidence relating to the site's qualifying features, which may be updated or supplemented in further publications from Natural England and other sources. The local evidence used in preparing this supplementary advice has been cited. The references to the national evidence used are available on request. Where evidence and references have not been indicated, Natural England has applied ecological knowledge and expert judgement. You may decide to use other additional sources of information.

In many cases, the attribute targets shown in the tables indicate whether the current objective is to 'maintain' or 'restore' the attribute. This is based on the best available information, including that gathered during monitoring of the feature's current condition. As new information on feature condition becomes available, this will be added so that the advice remains up to date.

The targets given for each attribute do not represent thresholds to assess the significance of any given impact in Habitats Regulations Assessments. You will need to assess this on a case-by-case basis using the most current information available.

Some, but not all, of these attributes can also be used for regular monitoring of the actual condition of the designated features. The attributes selected for monitoring the features, and the standards used to assess their condition, are listed in separate monitoring documents, which will be available from Natural England.

These tables do not give advice about SSSI features or other legally protected species which may also be present within the European Site.

If you have any comments or queries about this Supplementary Advice document please contact your local Natural England adviser or email HDIRConservationObjectivesNE@naturalengland.org.uk

About this site

European Site information

Name of European Site	The Lizard Special Area of Conservation (SAC)
Location	Cornwall
Site Maps	The designated boundary of this site can be viewed here on the MAGIC website
Designation Date	1 April 2005
Qualifying Features	See section below
Designation Area	3087.58
Designation Changes	N/A
Feature Condition Status	Details of the feature condition assessments made at this site can be found using Natural England's Designated Sites System
Names of component Sites of Special Scientific Interest (SSSIs)	Baulk Head to Mullion SSSI Caerthillian to Kennack SSSI Coverack to Porthoustock SSSI (approximately 80 ha of the north-eastern corner of the SSSI is not part of the SAC) East Lizard Heathlands SSSI Goonhilly Downs SSSI Kennack to Coverack SSSI Mullion Cliff to Predannack Cliff SSSI West Lizard SSSI
Relationship with other European or International Site designations	Lizard Point SAC encompasses marine waters around the Lizard peninsula, from Baulk Head on the west coast to Polbream Point on the east coast. It wraps around the coast and its coastal boundary is coincident with that of The Lizard SAC along this stretch. The south-eastern extent of Fal and Helford SAC lies approximately 2 km north of The Lizard SAC on the east coast of the peninsula.

Site background and geography

The Lizard peninsula forms the southern-most point of mainland Britain. The area is dominated by a gently undulating exposed heathland plateau cut by narrow river valleys. The surrounding coastline is rugged and geologically complex with caves, enclosed bays and small rocky islands. The geology is unusual and varied and includes the Lizard's famous serpentinite rock as well as, gabbro, schist, gneiss and slate.

The Lizard SAC is an extensive complex of coastal, heathland and wetland habitats on the Lizard peninsula. It lies within the Lizard National Character Area (NCA Profile 157) and the Cornwall Area of Outstanding Natural Beauty. The combination of its complex geology, topography, southern location and mild oceanic climate has resulted in a diverse range of vegetation types, including many rare species and some unique communities. A large proportion of the site is encompassed within The Lizard National Nature Reserve.

The site includes a typical sequence of cliff vegetation, with a variety of truly maritime plants, which grades into grazed and ungrazed communities on exposed cliffs. There are extensive areas of heathland rich in the rare Cornish heath *Erica vagans*. This habitat occurs on poorly-drained soils derived from ultra-basic serpentine and gabbro. It contains unusual mixtures of species characteristic of acid soils growing with species typical of base-rich soils, ranging from cliff-top heaths rich in maritime species, such as spring squill *Scilla verna*, to more inland heaths containing abundant bristle bent *Agrostis curtisii*. More typical stands of heath, sometimes called 'short heath' also occur. These are dominated by heather and bell heather.

The site also supports a unique series of oligo-mesotrophic (nutrient-poor to moderate nutrient status) waterbodies which have a high base status. Unusually their high base-status is due to igneous geology rather than limestone or shell-sand. Serpentine rock gives rise to calcium-deficient ground waters that are rich in magnesium. The waterbodies support a rare combination of plants with stoneworts *Chara* species, typical of calcareous lakes, growing together with species normally associated with acid conditions, such as bog pondweed *Potamogeton polygonifolius*.

There are also widespread examples of the serpentine variant of Mediterranean temporary ponds on the Lizard heaths. A number of rare species, including chives *Allium schoenoprasum*, dwarf rush *Juncus capitatus* and land quillwort *Isoetes histrix*, occur in this habitat type. The acid pool type is the main locality on the Lizard for an important assemblage of rare species, including pigmy rush *Juncus pygmaeus*, three-lobed crowfoot *Ranunculus tripartitus* and yellow centaury *Cicendia filiformis*.

About the qualifying features of the SAC

The following section gives you additional, site-specific information about this SAC's qualifying features. These are the natural habitats and/or species for which this SAC has been designated.

Qualifying habitats:

- **H1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts**

Vegetated sea cliffs are steep slopes fringing hard or soft coasts, created by past or present marine erosion, and supporting a wide diversity of vegetation types with variable maritime influence. Exposure to the sea is a key determinant of the type of sea cliff vegetation. In the UK exposure is greatest on the south-west and northern coasts, where the long oceanic fetch associated with these coasts generates high waves and swell, and the prevailing winds help deliver salt spray to the cliff face and cliff tops. The most exposed areas of cliff support maritime vegetation dominated by a range of salt-tolerant plants. More sheltered cliffs support communities closely related to those found on similar substrates inland, such as grassland and heath, with only a minor maritime element in the flora.

Cliff structure and geomorphological processes are major influences on cliff vegetation. The profile and stability of the cliff face is one of the major determinants of cliff vegetation. Even near-vertical cliffs support specialist crevice communities, while ledges occupied by breeding seabirds may develop specialist nitrogen-tolerant communities of plant species which are able to cope with heavy guano deposition. On less extreme slopes, species tolerant of exposure to wind and salt spray and of thin soils can find a foothold. The most characteristic maritime cliff communities occur in such situations. On relatively stable soft cliffs a wide range of progressively less-specialised communities can occur, including grassland, heath, scrub and even woodland. More mobile soft cliffs show a complex sequence of successional communities related to degrees of instability and the age of the slope. The vegetation of these sites typically comprises a mosaic of pioneer, ruderal, grassland, scrub and woodland communities. Streams and flushes provide a freshwater wetland element, and seepage lines may be rich in orchids.

The Lizard SAC, at the extreme south-west tip of England, has been selected for its unusual representation of base-rich igneous and acid metamorphic cliffs. The combination of its complex geology and a southern location has resulted in the diverse nature of the plants and plant communities found here, many of which are particularly species-rich and some of which are rare in the UK.

The site includes a typical sequence of cliff vegetation, with a variety of truly maritime plants, which grades into grazed and un-grazed communities on exposed cliffs with dense red fescue *Festuca rubra* and wild asparagus *Asparagus officinalis* ssp. *prostratus*. There are also transitions to heathland, normally dominated by heather *Calluna vulgaris* and bell heather *Erica cinerea*, though in addition the Lizard has extensive heathland which is rich in the rare Cornish heath *Erica vagans*. The Lizard is one of the richest botanical areas in the UK owing to its unusual ecology and outlying representatives of rare species.

- **H3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.**

This habitat type is characterised by water with a high base content, most often calcium but very rarely magnesium, and is usually confined to areas of limestone and other base-rich substrates, from which the dissolved minerals are derived.

In part the rarity of the habitat type is due to the fact that since calcareous rocks are free-draining, waterbodies occur on the surface of these rocks only very rarely. In addition, such waterbodies are characterised by very clear water and low nutrient status. They are therefore largely restricted to situations where the catchment or aquifer from which they are supplied with water remains relatively unaffected by intensive land-use or other sources of nutrients, and they are most often found in areas supporting mosaics of semi-natural vegetation.

Abundant charophytes (stoneworts) are typically the most prominent component of the vegetation of this habitat type. They can occur as dense beds that cover a significant part of the lake bottom over muddy marl deposits.

The coastal peninsula of the Lizard in south-west England supports a nationally unique series of oligo-mesotrophic waterbodies in which high base-status is not due to limestone or shell-sand. The Lizard is partly underlain by igneous serpentine rock which gives rise to calcium-deficient ground waters that are rich in magnesium. Groundwater drains from adjoining wet and dry serpentine heaths to feed the oligo-mesotrophic waterbodies in which another unusual feature is the occurrence of stoneworts *Chara* species typical of calcareous lakes, together with species normally associated with acid conditions, such as bog pondweed *Potamogeton polygonifolius*. Stoneworts present include three Red Data Book species *Chara baltica*, *C. curta* and *C. fragifera*.

- **H3170 Mediterranean temporary ponds *Priority feature**

Mediterranean temporary ponds typically consist of winter-flooded areas, which dry out and are colonised by vegetation rich in annual plants; many of these are nationally rare species of southern European distribution, which are principally confined to this habitat type. There are two main pool types: a more acid pool community of trampled and grazed areas (often found on flooded trackways), and a basic pool type on serpentine rock found only at The Lizard, Cornwall.

This habitat mainly occurs within the Mediterranean countries and only one site in the UK, The Lizard, is known to contain significant areas of this habitat type with the rich assemblages of the rare and local species for which the habitat type is noted.

There are widespread examples of the serpentine variant of Mediterranean temporary ponds on the Lizard heaths. A number of rare species, including chives *Allium schoenoprasum*, dwarf rush *Juncus capitatus* and land quillwort *Isoetes histrix*, occur in this habitat type.

The acid pool type is the main locality on the Lizard for an important assemblage of rare species, including pigmy rush *Juncus pygmaeus*, three-lobed crowfoot *Ranunculus tripartitus* and yellow centaury *Cicendia filiformis*. A number of these pools support important invertebrate populations, including the water beetles *Graptodytes flavipes* and *Dryops striatellus*. However, in many areas the habitat type is much reduced, as trackways that once ensured the creation of the pools have fallen into disuse.

- **H4010 Northern Atlantic wet heaths with *Erica tetralix***

This habitat type usually occurs on acidic, nutrient-poor substrates, such as shallow peats or sandy soils with impeded drainage. The vegetation is typically dominated by mixtures of cross-leaved heath *Erica tetralix,* heather *Calluna vulgaris*, grasses, sedges and Sphagnum bog-mosses.

The Lizard peninsula in the extreme south-west of England has a unique type of wet heath, NVC type H5 *Erica vagans – Schoenus nigricans* heath. This wet heath occurs extensively on poorly-drained soils derived from ultra-basic serpentine and gabbro. It contains unusual mixtures of species characteristic of acid soils growing with species typical of base-rich soils.

- **H4030 European dry heaths**

European dry heaths typically occur on freely-draining, acidic to circumneutral soils with generally low nutrient content. Ericaceous dwarf-shrubs dominate the vegetation. The most common is heather *Calluna vulgaris*, which often occurs in combination with gorse *Ulex* spp., bilberry *Vaccinium* spp. or bell heather *Erica cinerea*, though other dwarf-shrubs are important locally. Nearly all dry heath is semi-natural, being derived from woodland through a long history of grazing and burning.

The typical inland, dry heathland on the Lizard is NVC type H4 *Ulex gallii – Agrostis curtisii* heath, sometimes called ‘short heath’, which differs from other dry heaths in the area which are Annex I type H4040 Dry Atlantic coastal heaths with *Erica vagans*. These heathlands are dominated by heather *Calluna vulgaris* and bell heather *Erica cinerea*. Western gorse Ulex gallii, Cornish heath *Erica vagans*,

cross-leaved heath *Erica tetralix* purple moor-grass *Molinia caerulea* and bristle bent *Agrostis curtisii* can be locally dominant. Good stands of this vegetation type are found on extensive loess deposits.

- **H4040 Dry Atlantic coastal heaths with *Erica vagans* * Priority feature**

This priority habitat type comprises coastal heaths on well-drained, moderately base-rich soils in areas with a warm oceanic climate. In the UK, it is usually found on soils derived from serpentine.

British examples of this habitat type correspond to NVC type H6 *Erica vagans* – *Ulex europaeus* heath. The vegetation is typically dominated by mixtures of Cornish heath *Erica vagans* and gorse *Ulex europaeus*, with smaller amounts of western gorse *U. gallii* and bell heather *E. cinerea*.

All good-quality areas of dry Atlantic coastal heaths with *Erica vagans* on the Lizard peninsula in south-west England are included in this site. The full range of structural and floristic variation within NVC type H6 *Erica vagans* – *Ulex europaeus* heath is covered, ranging from cliff-top heaths rich in maritime species, such as spring squill *Scilla verna*, to more inland heaths containing abundant bristle bent *Agrostis curtisii*.

Qualifying Species:

Not applicable to this SAC.

Table A: Presence of qualifying SAC features within component SSSIs

SAC Feature	Baulk Head to Mullion SSSI	Caerthillian to Kennack SSSI	Coverack to Porthoustock SSSI	East Lizard Heathlands SSSI	Goonhilly Downs SSSI	Kennack to Coverack SSSI	Mullion Cliff to Predannack Cliff SSSI	West Lizard SSSI
H1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts	Y	Y	Y			Y	Y	Y
H3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.								Y
H3170 Mediterranean temporary ponds				Y				Y
H4010 Northern Atlantic wet heaths with Erica tetralix		Y	Y	Y	Y	Y	Y	Y
H4030 European Dry Heath				Y	Y	Y	Y	Y
H4040 Dry Atlantic coastal heaths with Erica vagans			Y	Y	Y	Y	Y	Y

Table 1: Supplementary Advice for Qualifying Features: H1230. Vegetated sea cliffs of the Atlantic and Baltic coasts

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution	**Extent of hard or soft cliff capable of supporting sea cliff vegetation**	Maintain the total extent of the cliff system which is capable of supporting H1230 sea cliff vegetation.	There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information. The extent of an Annex I habitat feature covers the sum extent of all of the component vegetation communities present and may include transitions and mosaics with other closely-associated habitat features. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. Where a reduction in the extent of a feature is considered necessary to meet the Conservation Objective for another Annex I feature, Natural England will advise on this on a case-by-case basis. The whole system acts to provide the range and variation of vegetation types and mosaics with bare ground. Extent may be measured in different ways but there are issues with measuring area of vertical cliffs. Reduction in extent can include smothering cliff slope, cliff foot or cliff top surfaces by artificial or dumped materials. Six SSSIs include cliffs which support H1230 sea cliff vegetation (Baulk Head to Mullion; Caerthillian to Kennack; Coverack to Porthoustock; Kennack to Coverack; Mullion Cliff to Predannack; West Lizard). However, the total extent of the cliff system which is capable of supporting H1230 sea cliff vegetation is not known. In total these six SSSIs cover 1613.9 ha, but this will includes areas that are not part of cliff systems (particularly on West Lizard SSSI), so the extent of the feature will be less than this.	This attribute will be periodically monitored as part of Natural England's site condition assessments. CEC (2006) Hopkins, J. J. (1979)
Extent and distribution	**Spatial distribution of the feature within the site**	Maintain and Restore the distribution and continuity of the H1230 feature and any associated transitions which reflects the natural functioning of the cliff system	A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional communities) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I	This attribute will be periodically monitored as part of Natural England's site condition assessments. CEC (2006)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for some of the typical and more specialist species associated with the Annex I habitat feature. Transitions include cliff top and cliff foot transitions to terrestrial or marine habitats. Target includes Restore because non-native invasive plant species are encroaching on some stands of cliff vegetation. Also, scrub and coarse vegetation are expanding in some areas. Scrub/coarse vegetation are components of H1230 sea cliff vegetation, but it is important that they do not encroach significantly onto less widespread communities or rare plant populations. Some cliff-top transitions have been truncated e.g. by intensive agriculture.	Hopkins, J. J. (1979)
Extent and distribution	**Future extent of habitat within the site and ability to respond to seasonal changes**	Maintain and where necessary restore active processes such that the system can adjust to longer-term natural change, including landward recession, and that fluctuations in the extent of vegetated areas to bare rock occur over time and space within the site.	This recognises the need to allow for natural fluctuations in the extent and the distribution of this habitat feature, often during particular seasons and usually as a result of natural coastal processes. Target includes Restore because landward recession is limited in a number of locations e.g. by intensive agriculture.	NATURAL ENGLAND. 2014. *The Lizard Site Improvement Plan v3.0*. Natural England.
Structure and function (including its typical species)	**Geo-morphological naturalness**	Maintain the geomorphological naturalness of the sea cliff system (from cliff top to foreshore connection with the intertidal zone	The physical landforms associated with this habitat feature, and the processes that shape them, will be a primary influence on sea-cliff habitat. A key criteria for selecting SACs for this habitat feature was that they had no or minimal artificial modification and so demonstrates good geomorphological naturalness. Having a well-developed sea-cliff structure, shaped by natural geomorphological processes, will ensure the full range of natural variation can occur.	
Structure and function (including its	**Presence of mosaic of microhabitats**	Maintain and where necessary restore the diversity and range of	Each site will have a different configuration of geology and hydrology and maritime exposure, which will also change over time and space. The key aim is to maintain the full, naturally expected range of these in as natural a state as	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
typical species)		microhabitats and bare eroded areas typical of the H1230 feature	possible. Exposed areas of cliff typically result from active coastal processes/landslips. Target includes Restore because landward recession is limited in a number of locations e.g. by intensive agriculture.	
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the H1230 feature are broadly referable to and characterised by the following National Vegetation Classification types: H7 - *Calluna vulgaris* - *Scilla verna* heath MC1 - *Crithmum maritimum* - *Spergularia rupicola* maritime rock-crevice community MC5 - *Armeria maritima* - *Cerastium diffusum* ssp. *diffusum* maritime therophyte community MC8 - *Festuca rubra* - *Armeria maritima* maritime grassland MC9 - *Festuca rubra* - *Holcus lanatus* maritime grassland MC10 - *Festuca rubra* - *Plantago* spp. maritime grassland	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. This will also help to conserve their typical plant species (i.e. the constant and preferential species of a community), and therefore that of the SAC feature, at appropriate levels (recognising natural fluctuations). The presence, composition, location and extent of maritime scrub, heath and/or grassland, plus mosaics of the three, on cliff slopes or cliff tops will be determined by the interaction of natural geomorphological processes with exposure and soil characteristics and management where relevant. The SAC encompasses all semi-natural NVC communities growing on the cliffs. The distribution of vegetation communities within the SAC is not fully understood so this list of NVC types is not exhaustive.	This attribute will be periodically monitored as part of Natural England's site condition assessments. CEC (2006) Hopkins, J. J. (1979)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		MC12 - *Festuca rubra - Hyacinthoides non-scripta* maritime bluebell community		
Structure and function (including its typical species)	**Vegetation: undesirable species**	Maintain and where necessary the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread: • Invasive non-native species, including *Carpobrotus* spp. should be absent or rare if already present • Undesirable species should be no more than rare. • 'Broadleaved grasses' should be sub-dominant to *Festuca rubra* • Where maritime grassland or maritime heathland are deemed to be important features, bracken and scrub should not be	Undesirable non-woody and woody vascular plants species may require active management to avert an unwanted succession to a different and less desirable state. Often they may be indicative of a negative trend relating to another aspect of a site's structure and function. These species will vary depending on the nature of the particular feature, and in some cases these species may be natural/acceptable components or even dominants. There are a range of non-native plants affecting coastal cliffs, and due to difficulties of access, these often pose problems with management. The key objective is to prevent any introductions or planting. This includes the dumping of spoil or organic waste on cliff tops or slopes within or beyond the site boundary which may contain plant seeds or propagules or enrich the site. The distribution of invasive non-natives is not fully understood. The other species listed are natural components of a range of vegetation types within the SAC. However, in certain circumstances (such as when they encroach on stands of rare plants) they can be undesirable and/or indicate negative pressures on the site. The main issues that are likely to result in increases in these species are reduction in grazing, eutrophication, and disturbance (e.g. from fire). Undesirable species include: *Cirsium arvense* Creeping thistle; *Cirsium vulgare* Spear thistle; *Lolium perenne* Perennial rye grass; *Pteridium aquilinum* Bracken; *Rumex obtusifolius* Broad-leaved dock; *Rumex crispus* Curled dock; *Senecio jacobaea* Common ragwort; *Trifolium repens* White clover; *Urtica dioica* Common nettle "Broad-leaved grasses" include *Agrostis stolonifera* Creeping bent, *Dactylis glomerata* Cock's-foot, and *Holcus lanatus* Yorkshire fog Target includes Restore because a number of communities and rare plant populations have suffered from invasive non-native and scrub encroachment.	This attribute will be periodically monitored as part of Natural England's site condition assessments.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		allowed to increase in cover and reduced where practical to do so.		
Structure and function (including its typical species)	**Key structural, influential and/or distinctive species: flora and fauna**	Maintain and where necessary restore the abundance of the species listed below to enable each of them to be a viable component of the Annex 1 habitat; Constant and preferential plant species of the H7 heath; MC1; MC5; MC8; MC9; MC10 and MC12 maritime grassland NVC communities that form the H1230 feature within this SAC Vascular plant assemblage including: *Asparagus prostratus* Wild Asparagus; *Asparagus officinalis* ssp. *prostratus* Sea Asparagus; *Genista pilosa* Hairy Greenweed; *Herniaria ciliolata* Fringed Rupturewort; *Hypochaeris maculata* Spotted Cat's-ear; *Isoetes histrix* Land Quillwort; *Juncus capitatus* Dwarf Rush; *Juncus pygmaeus* Pygmy Rush; *Trifolium bocconei* Twin-headed Clover	Some plant or animal species (or related groups of such species) make a particularly important contribution to the necessary structure, function and/or quality of an Annex I habitat feature at a particular site. These species will include; • **Structural** species which form a key part of the Annex I habitat's structure or help to define that habitat on a particular SAC (see also the attribute for 'vegetation community composition'). • **Influential** species which are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of soil/sediment), grazers, surface borers, predators or other species with a significant functional role linked to the habitat) • **Site-distinctive** species which are considered to be a particularly special and distinguishing component of an Annex I habitat on a particular SAC. There may be natural fluctuations in the frequency and cover of each of these species. The relative contribution made by them to the overall ecological integrity of a site may vary, and Natural England will provide bespoke advice on this as necessary. The list of species given here for this Annex I habitat feature at this SAC is not necessarily exhaustive. The list may evolve, and species may be added or deleted, as new information about this site becomes available. Target includes Restore because a number of populations of rare plants have been reduced/lost due to encroachment from invasive non-natives and scrub and other coarse vegetation.	This attribute will be periodically monitored as part of Natural England's site condition assessments. Douglass, J. (2017)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Important bryophyte assemblage including: *Lejeunea mandonii* Atlantic Lejeunea Important lichen assemblage including *Caloplaca aractina; Cladonia mediterranea; Collema latzelii; Heterodermia leucomela; Heterodermia speciose; Parmotrema robustum; Physcia tribacioides; Solenopsora liparina; Teloschistes flavicans* Important Lepidoptera populations including: *Boloria selene* Small Pearl-bordered Fritillary; *Eurodryas aurinaria* Marsh Fritillary; *Plebejus argus* Silver-studded Blue; *Hadena albimacula* White-spot moth Important breeding bird populations including: *Pyrrhocorax pyrrhocorax* Chough; *Falco peregrinus* Peregrine falcon; *Corvus corax* Raven; *Sylvia undata* Dartford Warbler		

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	**Regeneration potential**	Maintain and restore where necessary semi-natural vegetation on the cliff-top (either within or beyond the site boundary as appropriate), and its connectivity with the lower cliff slopes.	This is important to ensure that there is a continuous supply of seed-rich semi-natural vegetation material from the clifftops to feed the sea-cliff system below. As the top of the cliff slumps and recedes as a result of natural processes, the vegetation dropping onto the lower slopes should provide suitable material for their re-colonisation with native plant species from adjacent semi-natural habitats above Target includes restore because semi-natural cliff top vegetation limited in places and also because landward recession is restricted in some areas e.g. by intensive agriculture.	NATURAL ENGLAND. 2014. *The Lizard Site Improvement Plan v3.0*. Natural England.
Supporting processes (on which the feature relies)	**Physical features supporting vegetation: crevices, ledges, isolated stacks etc.**	Maintain the associated physical components of the vegetated cliff feature (crevices, ledges, isolated stacks) with changes to them determined by natural processes only	Cliff structure and geomorphological processes are major influences on sea-cliff vegetation. 'Hard' cliffs with vertical or very steep faces are characteristic of hard igneous, metamorphic and sedimentary rocks and also of chalk, which, although a soft rock, nevertheless forms vertical cliffs. More mobile 'Soft' cliffs have a sloping or slumped profile, often with a distinct 'undercliff'; these occur on a range of soft rocks, or on hard rocks interspersed with softer deposits and may be subject to mudslides or landslips. These processes all create smaller structural elements such as ledges, crevices and stacks which create complexes of pioneer and more mature vegetation which are typical of this habitat feature.	
Supporting processes (on which the feature relies)	**Hydrology/ drainage**	At a site, unit and/or catchment level as necessary, maintain and restore natural hydrological processes to provide the conditions necessary to sustain the feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. There are a number of important wetlands within the cliff complex, but no detailed work has been done on their hydrology and so the water supply mechanisms are not known.	
Supporting processes (on which the feature relies)	**Maritime exposure including salt spray effects**	Maintain an appropriate degree of exposure to maritime effects, such as salt spray, both from regular inputs and storm events	Excessive exposure to salt spray can cause episodic die-back of sea cliff vegetation in some circumstances, although this may not be applicable to all sites.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature relies)	**Water quality**	Where the feature is dependent on surface water and/or groundwater, maintain water quality and quantity to a standard which provides the necessary conditions to support the feature. .	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC. There are a number of important wetlands within the cliff complex, but no detailed work has been done on their hydrology and so the water supply mechanisms are not known. Neither is there any detailed water quality data so it is not possible to set specific targets.	
Supporting processes (on which the feature relies)	**Air quality**	Restore as necessary, the concentrations and deposition of air pollutants to within the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	This habitat type is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition and causing the loss of sensitive typical species associated with it. Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH3), oxides of nitrogen (NOx) and sulphur dioxide (SO2), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis. Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales.	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Critical loads/levels are not defined on APIS for the H1230 sea cliff vegetation SAC feature. However, they are defined for the heath SAC features. These loads/levels were used since heath vegetation is an important component of the sea cliff vegetation. Target set to Restore because critical load for nitrogen deposition is exceeded.	
Supporting processes (on which the feature relies)	**Cliff morphology, slope and elevation**	Maintain the natural processes that determine cliff morphology, slope and elevation of the H1230 feature	These physical components greatly influence the structure of this habitat type. Allowing natural dynamic processes to operate is important to providing optimal conditions which will allow the long-term conservation of this habitat feature. Interruption of these processes, through partial stabilisation or slowing of cliff erosion and recession rates, with artificial management of cliff slope vegetation, does not produce naturally-occurring conditions which could lead to undesirable changes in characteristic sea cliff vegetation.	
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: The targets for some attributes listed above include both 'maintain' or 'restore' objectives. This is because The Lizard SAC is an extensive complex of geographically-separate component sites which are currently in different states of condition. Overall, both objectives will be applicable to the SAC but these will differ between each component site depending on its particular circumstances. Natural England will able to provide further specific advice on request.				

Table 2: Supplementary Advice for Qualifying Features: H3140. Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	**Extent of the feature within the site**	Maintain the total extent of the H3140 feature at Hayle Kimbro and Ruan Pools; Croft Pascoe and Bray's Cot	There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information. The extent of an Annex I habitat feature covers the sum extent of all of the component vegetation communities present and may include transitions and mosaics with other closely-associated habitat features. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. Where a reduction in the extent of a feature is considered necessary to meet the Conservation Objective for another Annex I feature, Natural England will advise on this on a case-by-case basis. The standing water feature occurs across the Lizard SAC in numerous pools, most notably at Hayle Kimbro, Ruan Pools, Croft Pascoe and Bray's Croft. Hayle Kimbro Pool comprises five oligiotrophic open water bodies varying in size and depth. The largest of the pools retains water even in the driest of years. Ruan Pool is at an advanced stage of hydroseral succession but still retains some open water.	
Structure and function (including its typical species)	**Invasive, non-native and/or introduced species**	Ensure non-native species categorised as 'high-impact' in the UK under the Water Framework Directive should be either rare or absent but if present are causing minimal damage to the H3140 feature	Non-native species constitute a major threat to many open water systems. Impacts may be on the habitat itself (e.g. damage to banks and consequent siltation) or directly on characteristic biota (through predation, competition and disease), or a combination of these. For example, species such as signal crayfish have been responsible for much of the decline of native crayfish through competition, habitat damage and the introduction of crayfish plague. The UK Technical Advisory Group of the Water Framework Directive produces a regularly updated classification of aquatic alien species (plants and animals) according to their level of impact. In general high impact species are of greatest concern but low or unknown impact species may be included	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			in the target on a site-specific basis where there is evidence that they are causing a negative impact (for example high cover values or abundances). Those taxa considered likely to colonise lakes, are indicated by an 'L' in the UKTAG guidance. Examples of such high-impact species may include Water Fern, New Zealand pygmy-weed and the zebra mussel.	
Structure and function (including its typical species)	**Macrophyte community structure**	Restore a characteristic zonation of macrophyte vegetation	This is a strongly characteristic structural aspect of this habitat feature. In many cases *Chara* (stoneworts) will be the dominant feature. Chara beds should normally cover a minimum of 50% of the photic zone, although extent will be variable according to site and seasonal changes. A restore target has been set as many of the pools supporting this feature are becoming over-vegetated.	
Structure and function (including its typical species)	**Macrophyte community structure**	Restore maximum depth of plant colonisation. This is likely to be the maximum depth colonised by *Chara* spp.	This is a strongly characteristic structural aspect of this habitat feature. It will be a response to water transparency, sediment type and disturbance. A restore target has been set as many of the pools supporting this feature are becoming over-vegetated.	
Structure and function (including its typical species)	**Macrophyte community structure**	Restore a characteristic and well defined hydrosere associated with the water body where this is present	A hydrosere is a naturally-occurring plant succession which occurs in an area of standing fresh water. Over time, an area of open freshwater will naturally dry out, ultimately becoming woodland. During this change, a range of different wetland habitat types such as swamp and marsh, will succeed each other. This structure around the margins of the lake creates a buffer zone that can help protect the lake from a limited amount of sediment and nutrient inputs. It also increases habitat heterogeneity providing additional food sources and refugia. A restore target has been set as many of the pools supporting this feature are becoming over-vegetated.	
Structure and function (including its typical species)	**Physical structure - lake shoreline**	Maintain the natural shoreline of the lake.	Inclusion of hard engineering solutions to lake management may have detrimental effects on lake ecology, replacing near-natural substrates with man-made materials. Alteration of the shoreline may also result in changes in water movements within the lake, which would have effects on patterns of sediment deposition.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	**Physical structure - lake substrate**	Maintain the natural and characteristic substrate for the lake. The character and extent of types of substrate should be considered.	Marl production is desirable, although this may be low or absent in oligotrophic hard waters. The distribution of sediment particle size and organic content influences the biology of the lake and will affect the suitability of within-lake habitats for invertebrates and macrophytes, and fish spawning grounds. Increases in sediment loading from activities in the catchment area, including those on the lake shore, may result in the smothering of coarse sediments. Increased inputs of leaf litter, as a result of scrub encroachment, may also be cause for concern, as organic-rich sediments may be a poor rooting medium for macrophytes.	
Structure and function (including its typical species)	**Key structural, influential and/or distinctive species: flora and fauna**	Restore the abundance of the species listed below to enable each of them to be a viable component of the Annex 1 habitat: *Chara* spp. including *Chara fragifera* and *Nitella opaca* Vascular plant assemblage including *Pilularia globulifera* Pillwort; *Hydrocotyle vulgaris* marsh pennywort; *Littorella uniflora* shoreweed; *Ranunculus tripartitus* Three-lobed water crowfoot	Some plant or animal species (or related groups of such species) make a particularly important contribution to the necessary structure, function and/or quality of an Annex I habitat feature at a particular site. These species will include; • **Structural** species which form a key part of the Annex I habitat's structure or help to define that habitat on a particular SAC (see also the attribute for 'vegetation community composition'). • **Influential** species which are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of soil/sediment), grazers, surface borers, predators or other species with a significant functional role linked to the habitat) • **Site-distinctive** species which are considered to be a particularly special and distinguishing component of an Annex I habitat on a particular SAC. There may be natural fluctuations in the frequency and cover of each of these species. The relative contribution made by them to the overall ecological integrity of a site may vary, and Natural England will provide bespoke advice on this as necessary. The list of species given here for this Annex I habitat feature at this SAC is not necessarily exhaustive. The list may evolve, and species may be added or deleted, as new information about this site becomes available.	This attribute will be periodically monitored as part of Natural England's site condition assessments.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	**Fisheries**	Restore as necessary a total projected estimate for biomass of total fish production at less than 200kg/ha (this should take into account the growth potential of the resident and stocked fish).	Fish communities may exert a strong influence on overall lake ecology and may cause or exacerbate eutrophication symptoms. Where fisheries are present it should be a balanced mixed fishery. There should be a presumption against stocking non-native species, carp and bream.	
Supporting processes (on which the feature relies)	**Water quality - phosphate**	Restore as necessary stable nutrient levels appropriate for lake type. The maximum annual mean concentration of TP is 10 µg P l-1 for deep (>3m) and 15 µg P l-1 for shallow (<3m) oligo-mesotrophic hard standing waters.	Increased loadings of P to a water body are likely to lead to higher algal biomass in the water column, which in turn can have significant impacts on the standing water ecosystem through, for example, competition with vascular plants for nutrients and light, changes in pH, oxygen depletion and production of toxins. Decreasing dissolved oxygen and increasing ammonia levels are associated with death and decay of algal blooms, as is a release of toxins from toxin-producing species. If palaeolimnological techniques or hindcast modelling have been employed to reconstruct natural background phosphorus concentrations for a particular lake, these can be used to set targets, although it may be necessary to accept a small deviation from these background conditions. Alternatively, historical water chemistry data may exist for individual lakes. Where existing, site-specific water column TP concentrations are consistently lower than the standard appropriate for the habitat type, a lower target should be applied to prevent deterioration from current status.	
Supporting processes (on which the feature relies)	**Water quality - nitrogen**	Restore as necessary a stable nitrogen concentration, which will typically be between 1-2mg/l	There is an increasing understanding that some standing waters are sensitive to nitrogen (N) enrichment and eutrophication may be driven by increases in N, but site-specific information is usually required to determine whether N or P is more important. Where P levels are significantly above their target values and there is evidence that the lake is N limited (for example by N levels falling to negligible levels in summer), N targets should be set in addition to P targets. We recommend that such targets should preferably be developed using site-specific information, but should be based around the threshold of 1-2mg/l identified by James et al. (2005). In this situation N targets should be used in combination with P targets to drive a management strategy for the lake that reduces all nutrient inputs.	JAMES, C., FISHER, J., RUSSEL, V., COLLINGS, S. & MOSS, B. 2005.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature relies)	**Water quality - acidity**	Maintain acidity levels at or close to unimpacted conditions - values of Acid Neutralising Capacity (ANC) should be typically pH 7.5-9.5 for oligo-mesotrophic hard lakes.	Changes in pH can alter the entire freshwater community present within a water body affecting all trophic levels. Potential causes of a shift in pH include air pollution and direct application of lime to the water column as an acidification amelioration strategy (this should not be carried out). Acidity levels should reflect un-impacted conditions. As a guide, pH 7.5-9.5 for oligo-mesotrophic hard lakes. Although, pH naturally fluctuates throughout the year, e.g. snow melt may lead to pulses of acid water, and increased plant biomass in summer may result in large fluctuations in pH, including daytime increases in pH values. Therefore pH is not used as a monitoring target, however its importance in affecting many in lake processes means that the pH of a water body should not be artificially altered.	
Supporting processes (on which the feature relies)	**Water quality - other pollutants**	Maintain water quality to good chemical status (i.e. compliance with relevant Environmental Quality Standards).	A wide range of pollutants may impact on habitat integrity depending on local circumstance. Good chemical status includes a list of EQSs for individual pollutants that are designed to protect aquatic biota with high levels of precaution.	
Supporting processes (on which the feature relies)	**Water quality - dissolved oxygen**	Adequate dissolved oxygen levels for health of characteristic fauna; typically >6mg/l for throughout the year.	As for species in terrestrial environments, dissolved oxygen (DO) is required for respiration by aquatic organisms. Anthropogenic activities leading to phytoplankton blooms and increased loadings of organic matter to lakes can cause decreases in the concentration of dissolved oxygen available to support the species present. Mean dissolved oxygen refers to DO being measured at 0.5m intervals throughout the entire water column where the water column is not stratified and measurements taken at 0.5 m intervals below the thermocline only where stratification occurs.	
Supporting processes (on which the feature relies)	**Water transparency**	Maintain the clarity of water at or to at least a depth of 3.5 metres	Water transparency is the major determinant of the depth of colonisation by macrophytes, therefore, it should not be reduced. This should allow plant colonisation to at least 3.5m, but if maximum depth of colonisation has previously been recorded at greater water depths this should be maintained. Increased nutrient loads leading to increased algal growth will reduce water transparency, disturbance of the sediment by water sports and bottom feeding fish such as carp and bream also increase turbidity and reduce water transparency. Increased sediment loads to a lake would also have this effect.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature relies)	**Water quality - algae**	Maintain Chlorophyll at a concentration which complies with WFD high ecological status. Blooms of blue-green or green algae should not occur in low nutrient waters.	Chlorophyll is the pigment used for photosynthesis by plants, and the concentration of chlorophyll in the water column during the growing season therefore provides a good measure of the abundance of phytoplankton. Phytoplankton is an important driver of structure and function in lakes and high phytoplankton levels (algal blooms) are usually associated with nutrient enrichment. Characteristic and representative non-charophyte algal cover may be significant, but excessive growths of uncharacteristic, filamentous algae on lake substrate or macrophytes are indicative of nutrient enrichment. UKTAG Lake Assessment Methods: Phytoplankton. Chlorophyll a and Percentage Nuisance Cyanobacteria. Available online at: http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/lake%20phytoplankton.pdf	
Supporting processes (on which the feature relies)	**Hydrology**	At a site, unit and/or catchment level (as necessary, maintain natural hydrological processes to provide the conditions necessary to sustain the feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. Hydrology influences lake ecosystem functioning in two ways: determining residence time (flushing) and water level fluctuations. Flushing of lakes is important for dilution and removal of nutrients and phytoplankton, and for reduction in sedimentation. The timing of different flushing rates within the year influences the biology of the lake. For example, reduced flushing in summer would encourage bloom conditions. Modifications of inflows and outlets or changes in hydrology, e.g. from flood control regimes, abstraction and gravel removal can lead to unnatural changes in lake levels. The hydrology of the pools is not well understood.	
Supporting processes	**Sediment load**	Maintain the natural sediment load to the pools within the SAC	Increases in the sediment load also increases nutrient loads to a site. Increases in non-calcium carbonate siltation could result from	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
(on which the feature relies)			increased lake productivity, changes in catchment land-use and drainage, lake level fluctuations, climatic fluctuations or changes in sewage treatment. Some peat slumping is acceptable, provided this is not induced due to land drainage.	
Supporting processes (on which the feature relies)	**Supporting off-site habitat**	Maintain the extent, quality and spatial configuration of land or habitat surrounding or adjacent to the site which is known to support the feature.	The structure and function of the qualifying habitat, including its typical species, may rely upon the continued presence of areas which surround and are outside of the designated site boundary. Changes in surrounding land-use may adversely (directly/indirectly) affect the functioning of the feature and its component species. This supporting habitat may be critical to the typical species of the feature to support their feeding, breeding, roosting, population dynamics ('metapopulations'), pollination or to prevent/reduce/absorb damaging impacts from adjacent land uses e.g. pesticide drift, nutrient enrichment.	CEC (2006) Hopkins, J. J. (1979)
Supporting processes (on which the feature relies)	**Air quality**	Restore, the concentrations and deposition of air pollutants to within the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	See the explanatory notes for this attribute above in Table 1. Critical loads/levels are not defined on APIS for the H3140 vegetation SAC feature. However, they are defined for the heathland SAC feature in which they occur so these have been used instead. Target set at Restore because nitrogen deposition currently exceeds the critical load.	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).
Supporting processes (on which the feature relies)	**Functional connectivity /isolation**	Restore the natural connectivity of the water body to other water bodies	The natural isolation of some standing water bodies can provide some protection from threats such as pollution and invasive species. Hydrological isolation can also lead to unique or diverse species assemblages this may be due to genetic isolation or the absence of predators. These water bodies should have their isolated state maintained. In contrast other standing water bodies naturally rely on hydrological connectivity to other freshwater systems for water supply, and can support migratory species. Hydrological connectivity may also be important for geneflow, and habitat and species resilience. These water bodies should have their hydrological connectivity maintained. Many of the oligo-mesotrophic hard waters will be aquifer-fed. Connectivity between lakes and surrounding wetlands are important for resource protection and ecosystem functioning and are particularly at	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			risk from drainage, water level stabilisation and shoreline modifications. Scrub encroachment is shrinking and splitting some pools, which form a complex in areas across the SAC. This encroachment needs to be managed to allow the pools to remain connected.	
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: The targets for some attributes listed above include both 'maintain' or 'restore' objectives. This is because The Lizard SAC is an extensive complex of geographically-separate component sites which are currently in different states of condition. Overall, both objectives will be applicable to the SAC but these will differ between each component site depending on its particular circumstances. Natural England will able to provide further specific advice on request.				

Table 3: Supplementary Advice for Qualifying Features: H3170. Mediterranean temporary ponds *

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	**Extent of the feature within the site**	Ensure that there are areas of ephemeral pools available each year.	There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information. The extent of an Annex I habitat feature covers the sum extent of all of the component vegetation communities present and may include transitions and mosaics with other closely-associated habitat features. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. Where a reduction in the extent of a feature is considered necessary to meet the Conservation Objective for another Annex I feature, Natural England will advise on this on a case-by-case basis. The pools are ephemeral and vary in extent from year to year so a specific area target has not been set. Trackways are a prominent feature of this habitat	
Structure and function (including its typical species)	**Invasive, non-native and/or introduced species**	Non-native species categorised as 'high-impact' in the UK under the Water Framework Directive should be either rare or absent but if present are causing minimal damage to the feature	Non-native species constitute a major threat to many open water systems. Impacts may be on the river habitat itself (e.g. damage to banks and consequent siltation) or directly on characteristic biota (through predation, competition and disease), or a combination of these. For example, species such as signal crayfish have been responsible for much of the decline of native crayfish through competition, habitat damage and the introduction of crayfish plague. The UK Technical Advisory Group of the Water Framework Directive produces a regularly updated classification of aquatic	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			alien species (plants and animals) according to their level of impact. In general high impact species are of greatest concern but low or unknown impact species may be included in the target on a site-specific basis where there is evidence that they are causing a negative impact (for example high cover values or abundances). Those taxa considered likely to colonise lakes, are indicated by an 'L' in the UKTAG guidance. Examples of such high-impact species may include Water Fern, New Zealand pygmy-weed and the zebra mussel.	
Structure and function (including its typical species)	**Plant community structure**	Restore as necessary characteristic zonation of vegetation. Depth distribution and structure will be site specific.	This will be a response to water depth, water transparency, sediment type and disturbance. Characteristic 'rings' of vegetation around ponds have been observed in some Mediterranean temporary ponds in Europe.	
Structure and function (including its typical species)	**Plant community structure**	Restore an open muddy habitat with an absence of scrub and tall grasses.	Maintaining an 'open' aspect to this habitat feature is important as scrub and tall grasses lead to shading and encroachment, which can be particularly problematic in small temporary water bodies. Leaf litter from scrub can also smother the substrate. Grazing may be important for keeping competitive and woody species in check. However, excessive grazing may lead to destruction of sensitive plant species, increases in water turbidity and eutrophication. Restore target selected because some pools have been encroached by vegetation.	
Structure and function (including its typical species)	**Physical structure - lake substrate**	Maintain the natural and characteristic substrate for the pond. The character and extent of types of substrate should be considered.	Mediterranean temporary ponds may be formed on a range of substrates e.g. clay, marl, sand or rock.	
Structure and function (including its typical	Water quality - nitrogen	Restore as necessary stable nutrient levels appropriate for water body type.	As there is a wide clinal range of community types included within this feature type, the acceptable range of chemical conditions should be set for individual sites, from recent or historical water chemistry data. Acceptable ranges of values for	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
species)			each variable should be established. Nutrient enrichment in MTP's is most likely to be a consequence of soil erosion, fertilizer applications, over-stocking or nitrogen deposition. Nutrient enrichment may lead to the distinctive annuals of MTP's being replaced by more competitive species. Water quality data is not available. However, nitrogen deposition currently exceeds the critical load for the heathland SAC vegetation which the pools occur in so target set at restore as necessary until further studies conclude no impact.	
Structure and function (including its typical species)	Key structural, influential and/or distinctive species	Restore as necessary the abundance of the species listed to enable each of them to be a viable component of the Annex I habitat feature: There are a number of rare species that are dependent on the H3170 Mediterranean temporary pond feature, including: *Cicendia filiformis* Yellow centaury; *Juncus pygmaeus* Pigmy rush; *Ranunculus tripartitus* Three-lobed water crowfoot; *Littorella uniflora* Shoreweed	Some plant or animal species (or related groups of such species) make a particularly important contribution to the necessary structure, function and/or quality of an Annex I habitat feature at a particular site. These species will include; • **Structural** species which form a key part of the Annex I habitat's structure or help to define that habitat on a particular SAC (see also the attribute for 'vegetation community composition'). • **Influential** species which are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of soil/sediment), grazers, surface borers, predators or other species with a significant functional role linked to the habitat) • **Site-distinctive** species which are considered to be a particularly special and distinguishing component of an Annex I habitat on a particular SAC. There may be natural fluctuations in the frequency and cover of each of these species. The relative contribution made by them to the overall ecological integrity of a site may vary, and Natural England will provide bespoke advice on this as necessary. The list of species given here for this Annex I habitat feature at this SAC is not necessarily exhaustive. The list may evolve, and species may be added or deleted, as new information about this site becomes available.	This attribute will be periodically monitored as part of Natural England's site condition assessments.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Restore target selected because some rare plants have been lost from former locations e.g. as bare ground has been encroached by coarse vegetation.	
Supporting processes (on which the feature relies)	Water quality - phosphate	Maintain stable nutrient levels appropriate for water body type.	As there is a wide clinal range of community types included within this feature type, the acceptable range of chemical conditions should be set for individual sites, from recent or historical water chemistry data. Acceptable ranges of values for each variable should be established. See CSM guidance for setting water quality targets. Nutrient enrichment in MTP's is most likely to be a consequence of soil erosion, fertilizer applications or over-stocking. Nutrient enrichment may lead to the distinctive annuals of MTP's being replaced by more competitive species.	
Supporting processes (on which the feature relies)	Water quality - acidity	Acidity levels should reflect unimpacted conditions - values of Acid Neutralising Capacity (ANC) considered to avoid significant impact on characteristic biota are laid out in the site's FCT (these are the same numerical values as used to protect high ecological status under the WFD in the UK). There are two main pool types: a more acid pool community of trampled and grazed areas, often found on flooded trackways, and a basic pool type on serpentine soil found only at The Lizard, Cornwall in England, which have a target pH range of 5-6.01.	Changes in pH can alter the entire freshwater community present within a water body affecting all trophic levels. Potential causes of a shift in pH include air pollution and application of lime (this should not be carried out).	Wheeler and Byfield (2005) *The Lizard Trackways Project 2002-2005* Abendroth, L. (2004)
Supporting processes (on which the feature relies)	Water quality - other pollutants	Achieve at least Good chemical status (i.e. compliance with relevant Environmental Quality Standards).	A wide range of pollutants may impact on habitat integrity depending on local circumstance. Good chemical status includes a list of EQSs for individual pollutants that are designed to protect aquatic biota with high levels of precaution.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Herbicides and pesticides may be a particular issue for crustaceans and amphibian tadpoles.	
Supporting processes (on which the feature relies)	Water quality - dissolved oxygen	Maintain adequate dissolved oxygen levels for health of characteristic fauna.	As for species in terrestrial environments, dissolved oxygen (DO) is required for respiration by aquatic organisms. Anthropogenic activities leading to phytoplankton blooms and increased loadings of organic matter to lakes can cause decreases in the concentration of dissolved oxygen available to support the species present.	
Supporting processes (on which the feature relies)	Water transparency	Maintain the clarity of water to an appropriate level	The type of substrate often determines water turbidity, which in turn influences the development of biological communities. Ponds located on rocky or sandy substrate usually have low mineral turbidity, whereas those overlying materials composed by smaller particle size, such as clay or marl are more suitable to sediment suspension and consequently may present more turbid waters. Turbidity can be increased by over-grazing	
Supporting processes (on which the feature relies)	Water quality - algae	Characteristic and representative algal cover may be present, but avoid excessive growths of uncharacteristic, filamentous algae on pond substrate or plants which is indicative of nutrient enrichment.	Excessive growth of algae may lead to the distinctive flora of MTP's being outcompeted due to shading.	
Supporting processes (on which the feature relies)	Hydrology	At a site, unit and/or catchment level (as necessary, maintain natural hydrological processes to provide the conditions necessary to sustain the feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. The hydrology of the pools is not well understood.	
Supporting processes (on	Sediment load	Maintain the natural sediment load	Increases in siltation could result from: increased pond productivity, changes in catchment land-use, such as	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
which the feature relies)			intensification of agriculture, climatic fluctuations and associated changes in drainage patterns.	
Supporting processes (on which the feature relies)	Air quality	Restore as necessary, the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	This habitat type is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition and causing the loss of sensitive typical species associated with it. Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific understanding. There are critical levels for ammonia (NH3), oxides of nitrogen (NOx) and sulphur dioxide (SO2), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis. Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales. Critical loads/levels are not defined on APIS for the H3170 SAC feature. However, they are defined for the heathland SAC feature in which the pools occur so these have been used instead. Target set at Restore because nitrogen deposition currently exceeds the critical load.	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).
Supporting processes (on which the feature relies)	**Functional connectivity/ isolation**	Restore the natural connectivity of the water body to other water bodies	The natural isolation of some standing water bodies can provide some protection from threats such as pollution and invasive species. Hydrological isolation can also lead to unique or diverse species assemblages this may be due to genetic	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			isolation or the absence of predators. These water bodies should have their isolated state maintained. In contrast other standing water bodies naturally rely on hydrological connectivity to other freshwater systems for water supply, and can support migratory species. Hydrological connectivity may also be important for gene-flow, and habitat and species resilience. These water bodies should have their hydrological connectivity maintained. Temporary water bodies will naturally be connected only seasonally if at all. Some areas are suffering from scrub encroachment, which is severing connectivity between some pools and drying out other wetland areas. Restoration works have been carried out under an NE/Plantlife project, which will need to be continued and monitored to prevent loss of these pools and trackways.	
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: The targets for some attributes listed above include both 'maintain' or 'restore' objectives. This is because The Lizard SAC is an extensive complex of geographically-separate component sites which are currently in different states of condition. Overall, both objectives will be applicable to the SAC but these will differ between each component site depending on its particular circumstances. Natural England will able to provide further specific advice on request.				

Table 4: Supplementary Advice for Qualifying Features: H4010. Northern Atlantic wet heaths with *Erica tetralix*; Wet heathland with cross-leaved heath

<table>
<tr><th colspan="2">Attributes</th><th>Targets</th><th>Supporting and Explanatory Notes</th><th>Sources of site-based evidence (where available)</th></tr>
<tr><td>Extent and distribution of the feature</td><td>Extent of the feature within the site</td><td>Maintain the current extent of the habitat feature.</td><td>There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information. The extent of an Annex I habitat feature covers the sum extent of all of the component vegetation communities present and may include transitions and mosaics with other closely-associated habitat features. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. Where a reduction in the extent of a feature is considered necessary to meet the Conservation Objective for another Annex I feature, Natural England will advise on this on a case-by-case basis.

Seven SSSIs include H4010 Northern Atlantic wet heaths with *Erica tetralix* (Caerthillian to Kennack; Coverack to Porthoustock; East Lizard Heathlands; Goonhilly Downs; Kennack to Coverack; Mullion Cliff to Predannack Cliff; West Lizard).

However, the total area of wet heath across the site is not known. Vegetation has been mapped across some of the SAC, but coverage is not complete. In addition, there is a continuous gradation between wet and dry heath communities and they occur in intimate mosaics, which makes delineating boundaries between different types (and consequently estimates of the area of each community) somewhat arbitrary (and not repeatable between different observers). Areas of heathland vegetation are available for some of the component SSSIs:

<table><tr><th>Site</th><th>Vegetation Communities</th></tr><tr><td>Caerthillian to Kennack</td><td>The whole site is 140.24 ha, but this includes areas of other SAC features and site fabric.</td></tr><tr><td>Coverack to Porthoustock</td><td>The whole site is 173.29 ha, but this includes areas of other SAC features and site fabric and approximately 80 ha of the north-eastern</td></tr></table></td><td>This attribute will be periodically monitored as part of Natural England's site condition assessments.

CEC (2006)

Hopkins, J. J. (1978)

Hopkins, J. J. (1979)</td></tr>
</table>

<table>
<tr><th colspan="2">Attributes</th><th>Targets</th><th>Supporting and Explanatory Notes</th><th>Sources of site-based evidence (where available)</th></tr>
<tr><td></td><td></td><td></td><td><table>
<tr><td></td><td>corner of the SSSI is not part of the SAC.</td></tr>
<tr><td>East Lizard Heaths</td><td>The whole site (283.53 ha) is a mosaic of wet and dry heath communities.</td></tr>
<tr><td>Goonhilly Downs</td><td>957 ha of heathland vegetation</td></tr>
<tr><td>Kennack to Coverack</td><td>Approximately 99 ha of heathland vegetation</td></tr>
<tr><td>Mullion Cliff to Predannack Cliff</td><td>The whole site is 109.59 ha, but this includes areas of other SAC features and site fabric.</td></tr>
<tr><td>West Lizard</td><td>The whole site is 775.85 ha, but this includes areas of other SAC features and site fabric.</td></tr>
</table></td><td></td></tr>
<tr><td>Extent and distribution of the feature</td><td>Spatial distribution of the feature within the site</td><td>Restore the distribution and configuration of the H4010 feature, including where applicable its component vegetation types, across the site</td><td>A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional communities) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for some of the typical and more specialist species associated with the Annex I habitat feature.

Vegetation has been mapped across some of the SAC, but the coverage is not complete. Up-to-date mapping is required.

Restore target selected because scrub and coarse vegetation have encroached some areas of wet heath and also areas of heathland within the SAC are fragmented, principally by intensive agriculture.</td><td>This attribute will be periodically monitored as part of Natural England’s site condition assessments.

CEC (2006)

Hopkins, J. J. (1978)

Hopkins, J. J. (1979)

NATURAL ENGLAND. 2014.</td></tr>
<tr><td>Structure and function (including its typical</td><td>Vegetation community transitions</td><td>Restore any areas of transition between the vegetation of the H4010 feature and communities which form other heathland-</td><td>Transitions/zonations between adjacent but different vegetation communities are usually related to naturally-occurring changes in soil, aspect or slope. Such 'ecotones' retain characteristics of each bordering community and can add value in often containing species not found in</td><td>This attribute will be periodically monitored as part of Natural England’s site condition</td></tr>
</table>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
species)		associated habitats, such as dry and humid heaths, mires, acid grasslands, scrub and woodland.	the adjacent communities. Retaining such transitions can provide further diversity to the habitat feature, and support additional flora and fauna. This is an important attribute as many characteristic heathland species utilise the transitions between vegetation types or use different vegetation types during different stages of their life cycle. Vegetation has been mapped across some of the SAC, but coverage is not complete. Up-to-date mapping is required. Restore target selected because some transitions have been truncated e.g. by intensive agriculture. There is scope for reverting some improved grassland areas to species-rich grassland or heathland.	assessments. CEC (2006) Hopkins, J. J. (1978) Hopkins, J. J. (1979) NATURAL ENGLAND. (2014)
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the H4010 feature are broadly referable to and characterised by the following National Vegetation Classification types: H5 - *Erica vagans* - *Schoenus nigricans* heath	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. This will also help to conserve their typical plant species (i.e. the constant and preferential species of a community), and therefore that of the SAC feature, at appropriate levels (recognising natural fluctuations).	This attribute will be periodically monitored as part of Natural England's site condition assessments. CEC (2006) Hopkins, J. J. (1978) Hopkins, J. J. (1979)
Structure and function (including its typical species)	**Vegetation structure: cover of dwarf shrubs**	Maintain an overall cover of dwarf shrub species which is typically between 40-90% of the H4010 feature	Variations in the structure of the heathland vegetation (vegetation height, amount of canopy closure, and patch structure) is needed to maintain high niche diversity and hence high species richness of characteristic heathland plants and animals. Many species also utilise the transitions between vegetation types or use different vegetation types during different stages of their life cycle. The structural character of the heathland feature is strongly influenced by the growing habits of its dominant species which in most cases will be ericoids (i.e. plants that look like heathers, including members of the Ericaceae and Empetraceae families). The ericaceous species heather or ling *Calluna vulgaris*, bell heather *Erica cinerea*, cross-leaved heath *Erica tetralix*, Dorset heath *Erica ciliaris*, Cornish heath *Erica vagans*,	This attribute will be periodically monitored as part of Natural England's site condition assessments.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			bilberry *Vaccinium myrtillus* and cowberry *Vaccinium vitisidaea* are the commonest and most characteristic dwarf-shrubs. Hybrids of Dorset and crossleaved heath and of bilberry and cowberry can be locally abundant. *Calluna* is usually the most abundant. Crowberry *Empetrum nigrum*, another common species in some coastal and transitional heaths, is not strictly ericaceous but is often treated as an ericoid species. The specific objective for dwarf shrub cover varies across the different component SSSIs of the SAC. This reflects the natural, optimal structure of the heathland vegetation on the Lizard which is due in part to the very sparce, open nature of the 'short heath' community which grows on the more acidic loess deposits and can have a relatively low dwarf shrub cover, with a higher ground cover of lower plants.	
Structure and function (including its typical species)	**Vegetation structure: heather age structure**	Maintain a diverse age structure amongst the ericaceous shrubs typically found on the site	Each phase of growth associated with the characteristic heathers which dominate this feature also represents different microclimatic conditions and microhabitats which may provide shelter or food to other organisms. Therefore, it is important to maintain a mosaic of heather in different phases of growth. Typically this age structure will consist of between 10-40% cover of (pseudo) pioneer heathers; 20-80% cover of building/mature heathers; <30% cover of degenerate heathers and less than <10% cover of dead heathers	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Vegetation structure: cover of gorse**	Restore a low cover of common gorse typically at <25 and the combined cover of *U. europaeus* and *U. gallii* at <50%	Gorse as a component of heathland is a very valuable wildlife habitat, and often a marker of relict heath and common. Both dense and spiny, it provides good, protected cover for many wildlife species: birds, mammals and reptiles; breeding habitat for rare or declining bird species, and excellent winter roosting. The flowers, borne at a time of year when other sources of pollen or nectar are in short supply, are particularly good for insects and other invertebrate pollinators. However gorse may cause problems if unchecked by dominating an area, eliminating other typical heathland species. Extensive mature stands may also be serious fire hazards. Restore target selected because common gorse has encroached some areas of wet heath.	This attribute will be periodically monitored as part of Natural England's site condition assessments.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	**Vegetation structure: tree cover**	Restore the open character of the H4010 feature, with a typically scattered and low cover of trees and scrub (<20% cover)	Scrub (mainly trees or tree saplings above 1 m in height) and isolated trees are usually very important in providing warmth, shelter, cover, food-plants, perches, territorial markers and sources of prey for typical heathland invertebrates and vertebrates. But overall cover of scrub and trees across this habitat feature should be maintained or restored to a fairly sparse level, with a structurally complex edge and with characteristic heathland vegetation as ground cover. If scrub is locally important for any associated species with their own specific conservation objectives, then a higher level of cover will be acceptable. The area of scrub/tree cover should be stable or not increasing as a whole Restore target selected because trees and scrub have encroached some areas of wet heath.	This attribute will be periodically monitored as part of Natural England's site condition assessments
Structure and function (including its typical species)	**Vegetation composition: bracken cover**	Maintain a low cover of dense bracken, typically at <5%	The spread of bracken *Pteridium aquilinum* is a problem on many lowland heathlands. The unpalatable nature and density of bracken as a tall-herb fern, and its decomposing litter, can smother and shade out smaller and more characteristic heathland vegetation. Usually active management of bracken is required to reduce or contain its cover across this habitat feature. But this fern has also some nature conservation value, for example on sites where fritillary butterflies occur and utilise bracken litter habitat. The specific objective for dense bracken cover may vary across the different component SSSIs of the SAC.	This attribute will be periodically monitored as part of Natural England's site condition assessments
Structure and function (including its typical species)	**Key structural, influential and/or distinctive species**	Restore the abundance of the species listed below to enable each of them to be a viable component of the Annex 1 habitat: Constant and preferential plant species of the H5 - *Erica vagans* - *Schoenus nigricans* heath NVC community which forms the H4010 feature at this SAC Vascular plant assemblage	See the supporting/explanatory notes for this feature given in Table 1 above. Restore target selected because populations of some of the rare plants have been reduced in size/lost e.g. through loss of bare ground.	This attribute will be periodically monitored as part of Natural England's site condition assessments Hopkins, J. J. (1978) Hopkins, J. J. (1979) Douglass, J (2017)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		including *Genista pilosa* Hairy Greenweed; *Herniaria ciliolata* Fringed Rupturewort; *Juncus capitatus* Dwarf Rush; *Juncus pygmaeus* Pygmy Rush; *Pilularia globulifera* Pillwort Important bryophyte assemblage including *Cephaloziella dentata* Toothed Threadwort; *Riccia bifurca* Lizard Crystalwort Important lichen assemblage including *Collema latzelii; Cladonia mediterranea; Leptogium britannicum*; *Parmotrema robustum*; *Physcia clementei*; *Teloschistes flavicans*; *Solenopsora liparina*; *Squamarina cartilaginea* Important lepidoptera assemblage including *Boloria selene* Small Pearl-bordered Fritillary; Coenonympha pamphilus Small heath; *Hipparchia semele* Grayling; *Argynnis aglaja* Dark green Fritillary; *Euphydryas aurinia* Marsh Fritillary; *Lasiommata megera* Wall brown Populations of breeding birds including *Caprimulgus europaeus* Nightjar; *Saxicola rubicola* Stonechat; *Anthus petrosus* Rock pipit; *Anthus pratensis*		

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Meadow pipit Populations of wintering hen harrier		
Structure and function (including its typical species)	**Vegetation: undesirable species**	Restore the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread; • Invasive non-natives < 1% cover • Undesirable species less than 1% cover • Trees & scrub: on wet heath < 10% trees & scrub	Undesirable non-woody and woody vascular plants species may require active management to avert an unwanted succession to a different and less desirable state. Often they may be indicative of a negative trend relating to another aspect of a site's structure and function. These species will vary depending on the nature of the particular feature, and in some cases these species may be natural/acceptable components or even dominants. The invertebrate assemblage is a feature of interest on this SSSI and so some flowering species in this list may be beneficial for a range of invertebrates and only become indicators of negative quality if they are over the established Exotic species, including *Rhododendron ponticum, Gaultheria shallon, Fallopia japonica Crassula helmsii,* should be eradicated if possible. Undesirable species include: *Cirsium arvense, Digitalis purpurea, Epilobium* spp. (excluding. *E. palustre*), *Chamerion angustifolium, Juncus effusus, J. squarrosus, Ranunculus* spp., *Senecio* spp., *Rumex obtusifolius, Urtica dioic*a, „coarse grasses". Tree and scrub spp include: *Alnus glutinosa, Betula spp., Pinus spp., Prunus spinosa, Quercus spp., Rubus spp., Salix* spp. Up to 25% scrub cover can be accepted if indicated in conservation objectives or management plan Restore target selected because *Rhododendron ponticum* has invaded some areas of wet heath.	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Functional connectivity with wider landscape**	Restore the overall extent, quality and function of any supporting features within the local landscape which provide a critical functional connection with the H4010 feature	This recognises the potential need at this site to maintain or restore the connectivity of the site to its wider landscape in order to meet the conservation objectives. These connections may take the form of landscape features, such as habitat patches, hedges, watercourses and verges, outside of the designated site boundary which are either important for the migration, dispersal and genetic exchange of those	NATURAL ENGLAND (2014)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			typical species closely associated with qualifying Annex I habitat features of the site. These features may also be important to the operation of the supporting ecological processes on which the designated site and its features may rely. In most cases increasing actual and functional landscape-scale connectivity would be beneficial. Where there is a lack of detailed knowledge of the connectivity requirements of the qualifying feature, Natural England will advise as to whether these are applicable on a case by case basis. Restore target selected because the inland areas of the SAC are surrounded and fragmented by relatively intensive agriculture.	
Structure and function (including its typical species)	**Adaptation and resilience**	Restore the H4010 feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site	This recognises the increasing likelihood of natural habitat features to absorb or adapt to wider environmental changes. Resilience may be described as the ability of an ecological system to cope with, and adapt to environmental stress and change whilst retaining the same basic structure and ways of functioning. Such environmental changes may include changes in sea levels, precipitation and temperature for example, which are likely to affect the extent, distribution, composition and functioning of a feature within a site. The vulnerability and response of features to such changes will vary. Using best available information, any necessary or likely adaptation or adjustment by the feature and its management in response to actual or expected climatic change should be allowed for, as far as practicable, in order to ensure the feature's long-term viability. The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being moderate, taking into account the sensitivity, fragmentation, topography and management of its habitats. This means that this site is considered to be vulnerable overall but moderately so. This means that some adaptation action for specific issues may be required, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual	NATURAL ENGLAND (2014) Natural England. 2015. *Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England* Available at: http://publications.naturalengland.org.uk/publication/4954594591375360

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable. Target set to restore because component sites of the SAC are fragmented e.g. by intensive agriculture.	
Supporting processes (on which the feature relies)	**Conservation measures**	Restore the management measures (either within and/or outside the site boundary as appropriate) which are necessary to restore the structure, functions and supporting processes associated with the feature	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements. Grazing is required for the maintenance of some heathland areas. Restore target selected because grazing is not currently occurring in all of these areas.	ENGLISH NATURE. (2004a) ENGLISH NATURE. (2004b). ENGLISH NATURE. (2005a) ENGLISH NATURE. (2005b). ENGLISH NATURE. (2005c). ENGLISH NATURE. (2005d) ENGLISH NATURE. (2005e) NATURAL ENGLAND. (2014)
Supporting processes (on which the feature relies)	**Soils, substrate and nutrient cycling**	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, to within typical values for the H4010 habitat.	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			This Annex 1 habitat has essentially raw soils with little humus and low nutrient status.	
Supporting processes (on which the feature relies)	**Air quality**	Restore the concentrations and deposition of air pollutants to within the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	See the supporting/explanatory notes for this attribute in Table 1 above. Target set to Restore because nitrogen deposition currently exceeds the critical load.	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).
Supporting processes (on which the feature relies)	**Water quality**	Where the feature is dependent on surface water and/or groundwater, maintain water quality and quantity to a standard which provides the necessary conditions to support the H4010 feature.	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC. The hydrology of the wet heath is not well understood. No water quality data is available.	
Supporting processes (on which the feature relies)	**Hydrology**	At a site, unit and/or catchment level (as necessary, maintain the natural hydrological regime to provide the conditions necessary to sustain the feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is presently generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			The hydrology of the wet heath is not well understood.	
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: N/A				

Table 5: Supplementary Advice for Qualifying Features: H4030. European dry heaths

<table>
<tr><th colspan="2">Attributes</th><th>Targets</th><th>Supporting and Explanatory Notes</th><th>Sources of site-based evidence (where available)</th></tr>
<tr><td>Extent and distribution of the feature</td><td>Extent of the feature within the site</td><td>Maintain the current extent of the habitat feature.</td><td>There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information. The extent of an Annex I habitat feature covers the sum extent of all of the component vegetation communities present and may include transitions and mosaics with other closely-associated habitat features. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. Where a reduction in the extent of a feature is considered necessary to meet the Conservation Objective for another Annex I feature, Natural England will advise on this on a case-by-case basis.

Five SSSIs include H4030 European dry heaths (East Lizard Heathlands; Goonhilly Downs; Kennack to Coverack; Mullion Cliff to Predannack Cliff; West Lizard).

However, the total area of dry heath across the site is not known. Vegetation has been mapped across some of the SAC, but coverage is not complete. In addition, there is a continuous gradation between dry and wet heath communities and they occur in intimate mosaics, which makes delineating boundaries between different types (and consequently estimates of the area of each community) somewhat arbitrary (and not repeatable between different observers). Areas of heathland vegetation are available for some of the component SSSIs:

<table><tr><th>Site</th><th>Vegetation Communities</th></tr><tr><td>East Lizard Heaths</td><td>The whole site (283.53 ha) is a mosaic of wet and dry heath communities.</td></tr><tr><td>Goonhilly Downs</td><td>957 ha of heathland vegetation</td></tr><tr><td>Kennack to Coverack</td><td>Approximately 99 ha of heathland vegetation</td></tr><tr><td>Mullion Cliff to Predannack Cliff</td><td>The whole site is 109.59 ha, but this includes areas of other SAC features and site fabric.</td></tr></table></td><td>This attribute will be periodically monitored as part of Natural England's site condition assessments.

CEC (2006)

Hopkins, J. J. (1978)

Hopkins, J. J. (1979)</td></tr>
</table>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			<table><tr><td>West Lizard</td><td>The whole site is 775.85 ha, but this includes areas of other SAC features and site fabric.</td></tr></table> Up-to-date mapping is required.	
Extent and distribution of the feature	**Spatial distribution of the feature within the site**	Restore the distribution and configuration of the H4030 feature, including where applicable its component vegetation types, across the site	A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional communities) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for some of the typical and more specialist species associated with the Annex I habitat feature. Vegetation has been mapped across some of the SAC, but coverage is not complete. Up to date mapping is required. Restore target selected because scrub and coarse vegetation have encroached some areas of European dry heath and also areas of heathland within the SAC are fragmented, principally by intensive agriculture.	This attribute will be periodically monitored as part of Natural England's site condition assessments. CEC (2006) Hopkins, J. J. (1978) Hopkins, J. J. (1979)
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the H4030 feature are broadly referable to and characterised by the following National Vegetation Classification types: H4 - *Ulex gallii - Agrostis curtisii* heath	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. This will also help to conserve	This attribute will be periodically monitored as part of Natural England's site condition assessments. CEC (2006) Hopkins, J. J. (1978)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		H7 - *Calluna vulgaris - Scilla verna* heath H8 - *Calluna vulgaris - Ulex gallii* heath H10 – *Calluna vulgaris – Erica cinerea* heath	their typical plant species (i.e. the constant and preferential species of a community), and therefore that of the SAC feature, at appropriate levels (recognising natural fluctuations).	Hopkins, J. J. (1979)
Structure and function (including its typical species)	**Vegetation community transitions**	Restore any areas of transition between the H4030 feature and communities which form other heathland-associated habitats, such as dry and humid heaths, mires, acid grasslands, scrub and woodland.	Transitions/zonations between adjacent but different vegetation communities are usually related to naturally-occurring changes in soil, aspect or slope. Such 'ecotones' retain characteristics of each bordering community and can add value in often containing species not found in the adjacent communities. Retaining such transitions can provide further diversity to the habitat feature, and support additional flora and fauna. This is an important attribute as many characteristic heathland species utilise the transitions between vegetation types or use different vegetation types during different stages of their life cycle. Restore target selected because some transitions have been truncated e.g. by intensive agriculture.	This attribute will be periodically monitored as part of Natural England's site condition assessments. CEC (2006) Hopkins, J. J. (1978) Hopkins, J. J. (1979)
Structure and function (including its typical species)	**Vegetation structure: cover of dwarf shrubs**	Maintain an overall cover of dwarf shrub species which is typically between 40-90%	Variation in the structure of the heathland vegetation (vegetation height, amount of canopy closure, and patch structure) is needed to maintain high niche diversity and hence high species richness of characteristic heathland plants and animals. Many species also utilise the transitions between vegetation types or use different vegetation types during different stages of their life cycle. The structural character of the heathland feature is strongly influenced by the growing habits of its dominant species which in most cases will be ericoids (i.e. plants that look like heathers, including members of *the Ericaceae and Empetraceae* families). The ericaceous species heather or ling *Calluna vulgaris*, bell heather *Erica cinerea*, cross-leaved heath *Erica tetralix*, Dorset heath *Erica ciliaris*, Cornish heath *Erica vagans*, bilberry *Vaccinium myrtillus* and cowberry *Vaccinium vitisidaea* are the commonest and most characteristic dwarf-shrubs. Hybrids of Dorset and crossleaved heath and of bilberry and cowberry can be locally abundant. Calluna is usually the most abundant. Crowberry *Empetrum nigrum*, another common species in some coastal and transitional heaths, is not strictly	This attribute will be periodically monitored as part of Natural England's site condition assessments.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			ericaceous but is often treated as an ericoid species. The specific objective for dwarf shrub cover varies across the different component SSSIs of the SAC. This reflects the natural, optimal structure of the heathland vegetation on the Lizard which is due in part to the very sparse, open nature of the 'short heath' community which grows on the more acidic loess deposits and can have a relatively low dwarf shrub cover, with a higher ground cover of lower plants. West facing coastal heath (H7) may be locally as low as 25% in its optimal state.	
Structure and function (including its typical species)	**Vegetation composition: bracken cover**	Maintain a low cover of dense bracken, typically at <10%	The spread of bracken *Pteridium aquilinum* is a problem on many lowland heathlands. The unpalatable nature and density of bracken as a tall-herb fern, and its decomposing litter, can smother and shade out smaller and more characteristic heathland vegetation. Usually active management of bracken is required to reduce or contain its cover across this habitat feature. But this fern has also some nature conservation value, for example on sites where fritillary butterflies occur and utilise bracken litter habitat.	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Vegetation structure: cover of gorse**	Restore cover of common gorse *Ulex europaeus* at <25% and the combined cover of *U. europaeus* and *U. gallii* at <50%	Gorse as a component of heathland is a very valuable wildlife habitat, and often a marker of relict heath and common. Both dense and spiny, it provides good, protected cover for many wildlife species: birds, mammals and reptiles; breeding habitat for rare or declining bird species, and excellent winter roosting. The flowers, borne at a time of year when other sources of pollen or nectar are in short supply, are particularly good for insects and other invertebrate pollinators. However gorse may cause problems if unchecked by dominating an area, eliminating other typical heathland species. Mature stands en masse may also be serious fire hazards. Restore target selected because gorse has encroached some areas of European dry heath.	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical	**Vegetation structure: tree cover**	Restore the open character of the H4030 feature, with a typically scattered and low cover of trees and scrub	Scrub (mainly trees or tree saplings above 1 m in height) and isolated trees are usually very important in providing warmth, shelter, cover, food plants, perches, territorial markers and sources of prey for typical heathland invertebrates and vertebrates. But overall cover of scrub and	This attribute will be periodically monitored as part of Natural England's site condition

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
species)		Scrub cover <15% Up to 25% scrub cover can be accepted if indicated in conservation objectives or management plan.	trees across this habitat feature should be maintained or restored to a fairly sparse level, with a structurally complex edge and with characteristic heathland vegetation as ground cover. If scrub is locally important for any associated species with their own specific conservation objectives, then a higher level of cover will be acceptable. The area of scrub/tree cover should be stable or not increasing as a whole Restore target selected because trees and scrub have encroached some areas of European dry heath. The specific targets for scrub cover may vary across the individual component SSSIs of the SAC.	assessments
Structure and function (including its typical species)	**Vegetation structure: heather age structure**	Maintain a diverse age structure amongst the ericaceous shrubs typically found on the site	Each phase of growth associated with the characteristic heathers which dominate this feature also represents different microclimatic conditions and microhabitats which may provide shelter or food to other organisms. Therefore, it is important to maintain a mosaic of heather in different phases of growth. Typically this age structure will consist of between 10-40% cover of (pseudo) pioneer heathers; 20-80% cover of building/mature heathers; <30% cover of degenerate heathers and less than <10% cover of dead heathers	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Vegetation: undesirable species**	Restore the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread; • Invasive non-natives < 1% cover • Undesirable species less than 1% cover	Undesirable non-woody and woody vascular plants species may require active management to avert an unwanted succession to a different and less desirable state. Often they may be indicative of a negative trend relating to another aspect of a site's structure and function. These species will vary depending on the nature of the particular feature, and in some cases these species may be natural/acceptable components or even dominants. The invertebrate assemblage is a feature of interest on this SSSI and so some flowering species in this list may be beneficial for a range of invertebrates and only become indicators of negative quality if they are over the established Exotic species, including *Rhododendron ponticum, Gaultheria shallon, Fallopia japonica Crassula helmsii,* should be eradicated if possible. Undesirable species include: *Cirsium arvense, Digitalis purpurea, Epilobium* spp. (excluding. *E. palustre*), *Chamerion angustifolium, Juncus effusus, J. squarrosus, Ranunculus* spp., *Senecio* spp., *Rumex*	This attribute will be periodically monitored as part of Natural England's site condition assessments.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			*obtusifolius, Urtica dioic*a, „coarse grasses". Restore target selected because *Rhododendron ponticum* has invaded some areas of wet heath.	
Structure and function (including its typical species)	**Key structural, influential and/or distinctive species**	Restore the abundance of the species listed to enable each of them to be a viable component of the H4030 habitat feature: Constant and preferential plant species of the H4; H7; H8; H10 heathland NVC communities which form the H4030 feature at this SAC Vascular plant assemblage including *Erica vagans* Cornish Heath; *Juncus capitatus* Dwarf Rush; *Juncus pygmaeus* Pygmy Rush Important Bryophyte populations including *Cephaloziella dentata* Toothed Threadwort; *Riccia bifurca* Lizard Crystalwort Important Lichen populations including *Collema latzelii; Cladonia mediterranea; Leptogium britannicum*; *Parmotrema robustum*; *Physcia clementei*; *Teloschistes flavicans*; *Solenopsora liparina*; *Squamarina cartilaginea* Important lepidoptera populations including *Boloria selene* Small Pearl-bordered Fritillary;	See the supporting/explanatory notes above in Table 1. Target set at Restore because populations of some of the rare plants have been reduced in size/lost e.g. through loss of bare ground.	This attribute will be periodically monitored as part of Natural England's site condition assessments. Hopkins, J. J. (1978) Hopkins, J. J. (1979)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Coenonympha pamphilus Small heath; *Hipparchia Semele* Grayling; *Argynnis aglaja* Dark green Fritillary; *Euphydryas aurinia* Marsh Fritillary; *Lasiommata megera* Wall brown Populations of breeding birds including *Caprimulgus europaeus* Nightjar; *Saxicola rubicola* Stonechat; *Anthus petrosus* Rock pipit; *Anthus pratensis* Meadow pipit Populations of wintering hen harrier		
Structure and function (including its typical species)	**Functional connectivity with wider landscape**	Restore the overall extent, quality and function of any supporting features within the local landscape which provide a critical functional connection with the site	This recognises the potential need at this site to maintain or restore the connectivity of the site to its wider landscape in order to meet the conservation objectives. These connections may take the form of landscape features, such as habitat patches, hedges, watercourses and verges, outside of the designated site boundary which are either important for the migration, dispersal and genetic exchange of those typical species closely associated with qualifying Annex I habitat features of the site. These features may also be important to the operation of the supporting ecological processes on which the designated site and its features may rely. In most cases increasing actual and functional landscape-scale connectivity would be beneficial. Where there is a lack of detailed knowledge of the connectivity requirements of the qualifying feature, Natural England will advise as to whether these are applicable on a case by case basis. Restore target selected because the inland areas of the SAC are surrounded and fragmented by relatively intensive agriculture.	NATURAL ENGLAND. (2014)
Structure and function (including its	**Adaptation and resilience**	Restore the H4030 feature's ability, and that of its supporting processes, to adapt or evolve to	This recognises the increasing likelihood of natural habitat features to absorb or adapt to wider environmental changes. Resilience may be described as the ability of an ecological system to cope with, and adapt	NATURAL ENGLAND. (2014)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
typical species)		wider environmental change, either within or external to the site	to environmental stress and change whilst retaining the same basic structure and ways of functioning. Such environmental changes may include changes in sea levels, precipitation and temperature for example, which are likely to affect the extent, distribution, composition and functioning of a feature within a site. The vulnerability and response of features to such changes will vary. Using best available information, any necessary or likely adaptation or adjustment by the feature and its management in response to actual or expected climatic change should be allowed for, as far as practicable, in order to ensure the feature's long-term viability. The overall vulnerability of this SAC to climate change has been assessed by Natural England (2015) as being moderate, taking into account the sensitivity, fragmentation, topography and management of its habitats. This means that this site is considered to be vulnerable overall but moderately so. This means that some adaptation action for specific issues may be required, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be advisable. Target set to restore because component sites of the SAC are fragmented e.g. by intensive agriculture.	Natural England. 2015. *Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England* Available at: http://publications.naturalengland.org.uk/publication/4954594591375360
Structure and function (including its typical species)	**Soils, substrate and nutrient cycling**	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, to within typical values for the habitat.	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature.	
Supporting processes (on which the feature relies)	**Conservation measures**	Restore the management measures (either within and/or outside the site boundary as appropriate) which are necessary	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found	ENGLISH NATURE. (2004a) ENGLISH NATURE.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		to restore the structure, functions and supporting processes associated with the feature	within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements. • Maintain low nutrient levels to maintain high numbers of species through the management activities of grazing, burning, mowing, sod-cutting and scrub/tree cutting. Management of succession is a critical aspect of management for this habitat, by a combination of active processes and grazing/cutting. • A range of invertebrates and plants require bare ground/peat where it is not too frequently disturbed by vehicles or feet. Grazing is required for the maintenance of some heathland areas. Restore target selected because grazing is not occurring in all of these areas.	(2004b). ENGLISH NATURE. (2005a) ENGLISH NATURE. (2005b). ENGLISH NATURE. (2005c). ENGLISH NATURE. (2005d) ENGLISH NATURE. (2005e) NATURAL ENGLAND. (2014)
Supporting processes (on which the feature relies)	**Air quality**	Restore as necessary, the concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	See the supporting/explanatory notes for this attribute in Table 1 above. Restore target selected because nitrogen deposition currently exceeds the critical load.	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).
Supporting processes (on which the feature relies)	**Water quality**	Where the feature is dependent on surface water and/or groundwater, maintain water quality and quantity to a standard which provides the necessary conditions to support the feature.	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			may be needed. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.	
Supporting processes (on which the feature relies)	**Hydrology**	At a site, unit and/or catchment level (as necessary, maintain natural hydrological processes to provide the conditions necessary to sustain the feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts.	
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: N/A				

Table 6: Supplementary Advice for Qualifying Features: H4040. Dry Atlantic coastal heaths with *Erica vagans*; Dry coastal heaths with Cornish heath *

<table>
<tr><th colspan="2">Attributes</th><th>Targets</th><th>Supporting and Explanatory Notes</th><th>Sources of site-based evidence (where available)</th></tr>
<tr><td>Extent and distribution of the feature</td><td>Extent of the feature within the site</td><td>Maintain the current extent of the habitat feature.</td><td>There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information.

The extent of an Annex I habitat feature covers the sum extent of all of the component vegetation communities present and may include transitions and mosaics with other closely-associated habitat features. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations.

Where a reduction in the extent of a feature is considered necessary to meet the Conservation Objective for another Annex I feature, Natural England will advise on this on a case-by-case basis.

Six SSSIs include H4040 Dry Atlantic coastal heaths with Erica vagans (Coverack to Porthoustock; East Lizard Heathlands; Goonhilly Downs; Kennack to Coverack; Mullion Cliff to Predannack Cliff; West Lizard).

However, the total area of H40040 heath across the site is not known. Vegetation has been mapped across some of the SAC, but coverage is not complete. In addition, there is a continuous gradation between wet and dry heath communities and they occur in intimate mosaics, which makes delineating boundaries between different types (and consequently estimates of the area of each community) somewhat arbitrary (and not repeatable between different observers). Areas of heathland vegetation are available for some of the component SSSIs:

<table><tr><th>Site</th><th>Vegetation Communities</th></tr><tr><td>Coverack to Porthoustock</td><td>The whole site is 173.29 ha, but this includes areas of other SAC features and site fabric and approximately 80 ha of the north-eastern</td></tr></table></td><td>This attribute will be periodically monitored as part of Natural England’s site condition assessments.

CEC (2006)

Hopkins, J. J. (1978)

Hopkins, J. J. (1979)</td></tr>
</table>

<table>
<tr><th colspan="2">Attributes</th><th>Targets</th><th>Supporting and Explanatory Notes</th><th>Sources of site-based evidence (where available)</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td></td><td>corner of the SSSI is not part of the SAC.</td></tr>
<tr><td>East Lizard Heaths</td><td>The whole site (283.53 ha) is a mosaic of wet and dry heath communities.</td></tr>
<tr><td>Goonhilly Downs</td><td>957 ha of heathland vegetation</td></tr>
<tr><td>Kennack to Coverack</td><td>Approximately 99 ha of heathland vegetation</td></tr>
<tr><td>Mullion Cliff to Predannack Cliff</td><td>The whole site is 109.59 ha, but this includes areas of other SAC features and site fabric.</td></tr>
<tr><td>West Lizard</td><td>The whole site is 775.85 ha, but this includes areas of other SAC features and site fabric.</td></tr>
</table>

Up-to-date mapping is required.</td><td></td></tr>
<tr><td>Extent and distribution of the feature</td><td>Spatial distribution of the feature within the site</td><td>Restore the distribution and configuration of the feature, including where applicable its component vegetation types, across the site</td><td>A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional communities) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat.

Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for some of the typical and more specialist species associated with the Annex I habitat feature.

Vegetation has been mapped across some of the SAC, but coverage is not complete. Up to date mapping is required.

Restore target selected because scrub and coarse vegetation have encroached some areas of Atlantic dry heath and also areas of heathland within the SAC are fragmented, principally by intensive agriculture.</td><td>This attribute will be periodically monitored as part of Natural England’s site condition assessments.

CEC (2006)

Hopkins, J. J. (1978)

Hopkins, J. J. (1979)</td></tr>
</table>

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification type: H6 - *Erica vagans - Ulex europaeus* heath	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. This will also help to conserve their typical plant species (i.e. the constant and preferential species of a community), and therefore that of the SAC feature, at appropriate levels (recognising natural fluctuations).	This attribute will be periodically monitored as part of Natural England's site condition assessments. CEC (2006) Hopkins, J. J. (1978) Hopkins, J. J. (1979)
Structure and function (including its typical species)	**Vegetation structure: cover of dwarf shrubs**	Maintain an overall cover of dwarf shrub species which is typically between 40-90%	Variation in the structure of the heathland vegetation (vegetation height, amount of canopy closure, and patch structure) is needed to maintain high niche diversity and hence high species richness of characteristic heathland plants and animals. Many species also utilise the transitions between vegetation types or use different vegetation types during different stages of their life cycle. The structural character of the heathland feature is strongly influenced by the growing habits of its dominant species which in most cases will be ericoids (i.e. plants that look like heathers, including members of the *Ericaceae* and *Empetraceae* families). The ericaceous species heather or ling *Calluna vulgaris*, bell heather *Erica cinerea*, cross-leaved heath *Erica tetralix*, Dorset heath *Erica ciliaris*, Cornish heath *Erica vagans*, bilberry *Vaccinium myrtillus* and cowberry *Vaccinium vitis-idaea* are the commonest and most characteristic dwarf-shrubs. Hybrids of Dorset and cross leaved heath and of bilberry and cowberry can be locally abundant. *Calluna* is usually the most abundant. Crowberry *Empetrum nigrum*, another common species in some coastal and transitional heaths, is not strictly ericaceous but is often treated as an ericoid species. The specific objective for dwarf shrub cover varies across the different component SSSIs of the SAC. This reflects the natural, optimal structure of the heathland vegetation on the Lizard which is due in part to the very sparse, open nature of the 'short heath' community which grows on the more acidic loess deposits and can have a relatively low	This attribute will be periodically monitored as part of Natural England's site condition assessments.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			dwarf shrub cover, with a higher ground cover of lower plants. West facing coastal heath (H7) may be locally as low as 25% in its optimal state.	
Structure and function (including its typical species)	**Vegetation structure: cover of gorse**	Restore cover of common gorse *Ulex europaeus* at <25% and the combined cover of *U. europaeus* and *U. gallii* at <50%	Gorse as a component of heathland is a very valuable wildlife habitat, and often a marker of relict heath and common. Both dense and spiny, it provides good, protected cover for many wildlife species: birds, mammals and reptiles; breeding habitat for rare or declining bird species, and excellent winter roosting. The flowers, borne at a time of year when other sources of pollen or nectar are in short supply, are particularly good for insects and other invertebrate pollinators. However gorse may cause problems if unchecked by dominating an area, eliminating other typical heathland species. Mature stands en masse may also be serious fire hazards. Restore target selected because common gorse has encroached some areas of Atlantic dry heath.	
Structure and function (including its typical species)	**Vegetation structure: heather age structure**	Maintain a diverse age structure amongst the ericacerous shrubs typically found on the site	Each phase of growth associated with the characteristic heathers which dominate this feature also represents different microclimatic conditions and microhabitats which may provide shelter or food to other organisms. Therefore, it is important to maintain a mosaic of heather in different phases of growth. Typically this age structure will consist of between 10-40% cover of (pseudo) pioneer heathers; 20-80% cover of building/mature heathers; <30% cover of degenerate heathers and less than <10% cover of dead heathers	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Key structural, influential and/or distinctive species**	Restore the abundance of the species listed below to enable each of them to be a viable component of the Annex 1 habitat: Constant and preferential plant species of the H6 - *Erica vagans - Ulex europaeus* heath heathland NVC communities which form the H4040 feature at	See the supporting/explanatory notes above in Table 1. Restore target selected because populations of some of the rare plants have been reduced in size/lost e.g. through loss of bare ground.	This attribute will be periodically monitored as part of Natural England's site condition assessments Hopkins, J. J. (1978) Hopkins, J. J. (1979)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		this SAC Vascular plant assemblage including *Erica vagans* Cornish Heath; *Juncus capitatus* Dwarf Rush; *Juncus pygmaeus* Pygmy Rush Important Bryophyte populations including *Cephaloziella dentata* Toothed Threadwort; *Riccia bifurca* Lizard Crystalwort Important Lichen populations including *Collema latzelii; Cladonia mediterranea; Leptogium britannicum*; *Parmotrema robustum*; *Physcia clementei*; *Teloschistes flavicans*; *Solenopsora liparina*; *Squamarina cartilaginea* Important lepidoptera populations including *Boloria selene* Small Pearl-bordered Fritillary; Coenonympha pamphilus Small heath; *Hipparchia Semele* Grayling; *Argynnis aglaja* Dark green Fritillary; *Euphydryas aurinia* Marsh Fritillary; *Lasiommata megera* Wall brown Populations of breeding birds including *Caprimulgus europaeus* Nightjar; *Saxicola rubicola* Stonechat; *Anthus petrosus* Rock pipit; *Anthus pratensis* Meadow pipit		

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Populations of wintering hen harrier		
Structure and function (including its typical species)	**Vegetation: undesirable species**	Restore the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread; • Invasive non-natives < 1% cover • Undesirable species less than 1% cover	Undesirable non-woody and woody vascular plants species may require active management to avert an unwanted succession to a different and less desirable state. Often they may be indicative of a negative trend relating to another aspect of a site's structure and function. These species will vary depending on the nature of the particular feature, and in some cases these species may be natural/acceptable components or even dominants. The invertebrate assemblage is a feature of interest on this SSSI and so some flowering species in this list may be beneficial for a range of invertebrates and only become indicators of negative quality if they are over the established Exotic species, including *Rhododendron ponticum, Gaultheria shallon, Fallopia japonica Crassula helmsii,* should be eradicated if possible. Undesirable species include: *Cirsium arvense, Digitalis purpurea, Epilobium* spp. (excluding. *E. palustre*), *Chamerion angustifolium, Juncus effusus, J. squarrosus, Ranunculus* spp., *Senecio* spp., *Rumex obtusifolius, Urtica dioic*a, „coarse grasses". Restore target selected because *Rhododendron ponticum* has invaded some areas of dry heath.	This attribute will be periodically monitored as part of Natural England's site condition assessments.
Structure and function (including its typical species)	**Functional connectivity with wider landscape**	Restore the overall extent, quality and function of any supporting features within the local landscape which provide a critical functional connection with the H4040 feature of the site	This recognises the potential need at this site to maintain or restore the connectivity of the site to its wider landscape in order to meet the conservation objectives. These connections may take the form of landscape features, such as habitat patches, hedges, watercourses and verges, outside of the designated site boundary which are either important for the migration, dispersal and genetic exchange of those typical species closely associated with qualifying Annex I habitat features of the site. These features may also be important to the operation of the supporting ecological processes on which the designated site and its features may rely. In most cases increasing actual and functional landscape-scale connectivity would be beneficial.	NATURAL ENGLAND. 2014. *The Lizard Site Improvement Plan v3.0*. Natural England. Available from: http://publications.naturalengland.org.uk/publication/5299463631405056

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Where there is a lack of detailed knowledge of the connectivity requirements of the qualifying feature, Natural England will advise as to whether these are applicable on a case by case basis. Restore target selected because the inland areas of the SAC are surrounded and fragmented by relatively intensive agriculture.	
Structure and function (including its typical species)	**Adaptation and resilience**	Maintain the H4040 feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site	See the supporting/explanatory notes above in Table 1. Target set to restore because component sites of the SAC are fragmented e.g. by intensive agriculture.	NATURAL ENGLAND. (2014) Natural England. 2015. *Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England* Available at: http://publications.naturalengland.org.uk/publication/4954594591375360
Structure and function (including its typical species)	**Soils, substrate and nutrient cycling**	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, to within typical values for the H4040 habitat.	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature.	
Supporting processes (on which the feature relies)	**Conservation measures**	Restore the management measures (either within and/or outside the site boundary as appropriate) which are necessary to restore the structure, functions and supporting processes	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the	ENGLISH NATURE. (2004a) ENGLISH NATURE. (2004b).

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		associated with the feature	Views about Management Statement for the underpinning SSSI and/or management agreements. In summary, measures include • Maintaining low nutrient levels to maintain high numbers of species through the management activities of grazing, burning, mowing, sod-cutting and scrub/tree cutting. Management of succession is a critical aspect of management for this habitat, by a combination of active processes and grazing/cutting. • A range of invertebrates and plants require bare ground/peat where it is not too frequently disturbed by vehicles or feet. Grazing is required for the maintenance of some heathland areas. Restore target selected because grazing is not currently occurring in all of these areas.	ENGLISH NATURE. (2005a) ENGLISH NATURE. (2005b). ENGLISH NATURE. (2005c). ENGLISH NATURE. (2005d) ENGLISH NATURE. (2005e) NATURAL ENGLAND. (2014)
Supporting processes (on which the feature relies)	**Air quality**	Restore the concentrations and deposition of air pollutants to within the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	See the supporting/explanatory notes for this attribute above. Target set to Restore because nitrogen deposition currently exceeds the critical load.	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).
Supporting processes (on which the feature relies)	**Water quality**	Where the feature is dependent on surface water and/or groundwater, maintain water quality and quantity to a standard which provides the necessary conditions to support the feature.	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature relies)	**Hydrology**	At a site, unit and/or catchment level (as necessary, maintain natural hydrological processes to provide the conditions necessary to sustain the feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts.	
Version Control Advice last updated: N/A				
Variations from national feature-framework of integrity-guidance: N/A				

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