Threatened Species Recovery Actions 2025 Baseline

Technical Report and Spreadsheet User Guide

Version 1.0

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NATURAL ENGLAND

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Partner organisations and acknowledgements

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- Natural Resources Wales
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- Plantlife International
- RSPB
- Species Recovery Trust
- Where the Wild stuff is…
- Zoological Society of London

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Special thanks also to Natural England's species specialists without whom this project would not have been possible.

Whilst TSRA is a partnership initiative, there is no implied endorsement of the dataset by partners or contributors. Natural England is responsible for final content decisions and any remaining errors.

This project has been funded by Natural England's Species Recovery Programme (SRP), which has been delivering species recovery projects for over 30 years, through a programme of targeted action for threatened species with bespoke needs.

Keywords

species action plan, species conservation, conservation triage, species recovery, reintroduction, extinction risk, Section 41, threatened species, species of conservation concern

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Foreword

This report, and its accompanying dataset, provide a delivery pathway for the 2042 Environment Act extinction risk target, setting out the specific measures needed to reverse species declines, and losses, in England.

The work builds on a considerable body of species action planning, stretching back several decades, e.g. UK BAP. The challenge today of recovering an increasing number of threatened species when time and resources are limited, has led to a new and highly prioritised approach. Action-planning criteria have been introduced and the number of actions per species capped. A Species Recovery Curve, with defined steps or milestones, provides an evaluation framework.

The baseline, presented here in full for the first time, has involved the evaluation of over 1,900 species, spanning over 40 taxonomic groups from a wide range of terrestrial, freshwater and marine habitats. The resultant datasheet comprises over 65,000 data points. Sustained recovery will require future updates to allow actions to be revised, further species to be added, and others removed when their populations recover sufficiently.

The project is the result of a large partnership of environmental Non-Governmental Organisations (eNGO's), expert societies, government agencies, individual specialists and consultants. In providing detailed targeted action for threatened species, it is hoped that 'Threatened Species Recovery Actions' will become widely used by conservation practitioners at all levels and especially influence action on the ground locally. Furthermore, Natural England's Species Recovery Programme will use TSRA as the evidence base to underpin the Programme.

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. While the accompanying dataset has been reviewed and aims to provide a consensus view, the opinions of individual contributors do not necessarily represent those of Natural England.

Executive summary

The Threatened Species Recovery Actions (TSRA) project is a partnership, species action-planning project, involving a wide partnership of organisations and individuals across the environmental sector. The project aims to identify threatened or declining taxa in England and to set out the key actions needed for their recovery or conservation. The project is considered an important step in the delivery pathway for the statutory 2042 Extinction Risk target The Environmental Targets (Biodiversity) (England) Regulations 2023.

The TSRA 2025 baseline, presented here for the first time, comprises a dataset spanning a wide range of taxonomic groups with species-focused actions at its heart, covering terrestrial, freshwater and marine groups. In addition to the dataset, this report details the approach, as well as the methodology, summary results and future plans. It is hoped that project outputs will guide the development of future species recovery projects and inform conservation priorities nationally.

Species were evaluated and actions drafted by a wide range of organisations and national experts across the environmental sector, over two years. Consensus and quality assurance were achieved through peer review and workshops, involving both external experts and Natural England species specialists.

TSRA focusses on species (taxa) with the following statuses in GB Red Lists: Threatened (Critically Endangered, Endangered, Vulnerable), Near Threatened, or Extinct (Regionally Extinct, Extinct in the Wild). Only species in these categories that were native to England are included, thereby maintaining alignment with the D5 indicator 'Red List Index for England'. In addition, Section 41 species (NERC Act 2006) are included, giving a total of over 2,000 taxa in the base list. Preventing the decline of Least Concern species is no less important with regard to target delivery but is outside the scope of TSRA. Least Concern species tend to be more common 'generalists' and less well suited to targeted or tailored actions. Moreover, only a proportion of Least Concern species are in decline; many have stable or even increasing populations.

Under TSRA, not every species is action planned. Each species is evaluated against two criteria which determine whether it qualifies for actions. As a result, only species considered priorities for targeted conservation in England are action planned. This highly prioritised approach was adopted in recognition of an increasing number of threatened species, and the many other targets and commitments in the current Environmental Improvement Plan (EIP23) which will support and sustain species recovery.

TSRA actions are 'species-specific' which means they are tailored or targeted to the species in question and exclude broader nature recovery and habitat measures. Examples of species-specific actions are: status reviews, research, trialling recovery solutions, and bespoke management. Actions are practical in nature rather than policy-orientated and aim to be SMART and progressive.

Species differ in their recovery potential and in the degree of recovery that can be reasonably expected. TSRA aims to differentiate between species with low, and medium-high, recovery potential. The purpose of this approach was to help contributors in their consideration of the types of actions necessary and had no bearing on the conservation importance of the species.

Climate change is an important pressure on rare and threatened species, and increasingly so. Contributors were encouraged to consider the adaptation requirements of species when setting actions. The adaptive approach taken by TSRA allows for actions to be tailored to climate impacts in future and to embrace new or improved adaptation techniques.

Each action was linked to a step on the Natural England Species Recovery Curve which provides a means of evaluation. In total, over 3,600 actions were authored for 1,384 qualifying taxa (73% of taxa evaluated). Due to a lack of availability of national experts, over 200 lichens were not evaluated and will be a priority to cover at the next TSRA update.

The 2025 baseline shows that actions which address evidence gaps were the most frequent, with just over a quarter of all actions classed as scientific research. Actions concerning surveys, status reviews, and targeted monitoring together amounted to a further 29%. On-the-ground recovery work, including actions for habitat management and creation (at all scales), local mitigation, reintroduction, climate change adaptation and special *in situ* measures, collectively comprised 26% of actions. Most actions (70%) were expected to have a lifespan of 5 years or less, although actions that needed to persist for more than 10 years were second most frequent (after those in the 3-5 year category). For place-based actions, most (67%) required implementation at 20 or fewer sites, although national scale actions amounted to a further 20% (second in importance after the 2-5 site category).

Despite the large number of species involved, TSRA has taken an individual species action-planning approach. This granularity allows maximum flexibility for actions to be grouped and organised for project planning and development. Identifying themes to develop into multi-taxa projects, both within and across taxonomic groups, is an important next step and will become possible once Natural England's Species Evidence Base is available. For example, it will be possible to group TSRA species (and their associated actions) for a particular wildlife-rich habitat, in a specific English region.

Cyclical updates will keep TSRA relevant and adaptive, responding to the latest available evidence and progressing species along their recovery curves. Actions only capture current priorities and, in isolation, will seldom result in sustained recovery. Although a reporting tool is not yet available, action-based reporting will be possible at updates, and progress can be evaluated using the Natural England Species Recovery Curve. Ultimately, the success of TSRA, in terms of the project's contribution to the extinction risk target, will depend upon regular updates.

Contents

1. Purpose of the report

This report has a dual purpose, to:

1. Set out the overall approach of the Threatened Species Recovery Actions project (TSRA), its methods, and summary results.

2. Act as a user guide to the accompanying spreadsheet (JP065 Threatened Species Recovery Actions - 2025 baseline.xls), which contains all of the actions and associated data.

The intended audience of the spreadsheet and the report is wide, ranging from conservation practitioners working at national and local levels, including government agency staff, eNGOs, local authorities and consultancies, to those simply wishing to act in the interests of species that are threatened with extinction.

The TSRA baseline project started in January 2023 and completed in May 2025. This report covers only this period (but note that future updates of TSRA are anticipated).

2. Introduction

Threatened Species Recovery Actions (TSRA) is a collaborative species action-planning project, involving a wide partnership of organisations and individuals. The project aimed to identify species (and selected taxa below the rank of species – hereafter referred to collectively as 'species') that are threatened or declining in England and to set out the key species-specific actions needed for their recovery or conservation. Species were selected from a list of species of conservation concern (section 5.1).

The work is an important step in the delivery pathway for the 2042 Species Extinction Risk target. In 2023, new legally-binding biodiversity targets were introduced for England: The Environmental Targets (Biodiversity) (England) Regulations 2023, including one to reduce the risk of species extinction by 2042, when compared to 2022. The target aligns with 'Target 4' of the recently published National Biodiversity Strategy and Action Plan | United Kingdom Biodiversity which reflects our international commitment to the CBD's Global Biodiversity Framework (DAERA, Scottish Government, Welsh Government and UK Government, 2025).

TSRA is not an alternative to landscape-scale approaches to restore nature. The project aligns with Lawton and others (2010), in acknowledging the need for, and efficacy of, both action at large scale, and targeted efforts to recover species. Moreover, a sustainable outcome for species, depends on broader mechanisms to

improve the extent, quality and connectivity of habitats at landscape scale, including the restoration of natural processes.

TSRA actions signify general agreement on the key priorities for each species at the time of writing, rather than commitments. The implementation of certain actions will require obtaining permissions and/or securing resources in advance (these are not covered by the project). Furthermore, action implementation can depend on many uncertain factors not detailed or made allowance for in TSRA. For example, when carrying out place-based actions, there may be a need to integrate with existing land-use and conservation priorities.

The TSRA baseline, presented here for the first time, comprises a dataset spanning a wide range of taxonomic groups with species-focused actions at its heart. Ultimately, it aims to improve delivery of species recovery, guiding the development of future projects and informing species conservation priorities nationally. Although led by Natural England, a large partnership of eNGOs, expert societies and individual specialists has been central to its production.

3. Partnership working

TSRA has taken a wide expert-elicitation approach, involving specialists from across the environmental sector. Peer reviews (internal and external) and workshops have built consensus as well as improved the quality of actions and species data. Nevertheless, it has not always been possible to arrive at a place of agreement for every species. In such cases, Natural England species specialists, together with the TSRA team, have made a judgement over content. Hence qualifying species and their actions do not necessarily carry the endorsement of contributors, although consensus was reached in the vast majority of cases.

4. Concept, approach & rationale

TSRA was designed to facilitate rapid assessment of high numbers of species. The process has similarities to the Section 41 species action planning under Biodiversity 2020, and UKBAP prior to that, but TSRA marks a shift to a more prioritised approach.

Under TSRA, not every species is action planned. Each species is evaluated against two criteria which determine whether it is a priority for targeted conservation in England. Only species which qualify under both criteria are action planned (section 5.3).

Each species can have a maximum of three actions, aiming to identify the highest priority work and address key blockers of recovery. TSRA aims to incrementally

progress species along their recovery curves, rather than attempting to predict the entire recovery pathway of each species which would involve many assumptions and a list of potentially uncertain actions. When TSRA is updated in future years, new actions can be added to replace those completed, or existing actions modified in light of new evidence, enabling an adaptive approach.

Actions are limited to steps on the Species Recovery Curve (SRC, Figure 1), albeit with the addition of site protection and species protection measures. TSRA focusses on practical and implementable action, excluding policy/legislative needs, delivery mechanisms, and wider environmental dependencies. This approach is adopted in recognition of the many other targets and commitments in the current Environmental Improvement Plan 2023 - GOV.UK (EIP23) which will support and sustain species recovery. The scope of TSRA is shown in Figure 2.

Whilst TSRA can do relatively little to help those species whose recovery is wholly dependent on removal of pressures, targeted action to reduce pressures locally (termed here 'local mitigation') is in scope. For example, an action to reduce air pollution nationally is not permissible under TSRA rules, whereas one to create a buffer strip at a site to protect a TSRA species from aerial ammonia is acceptable.

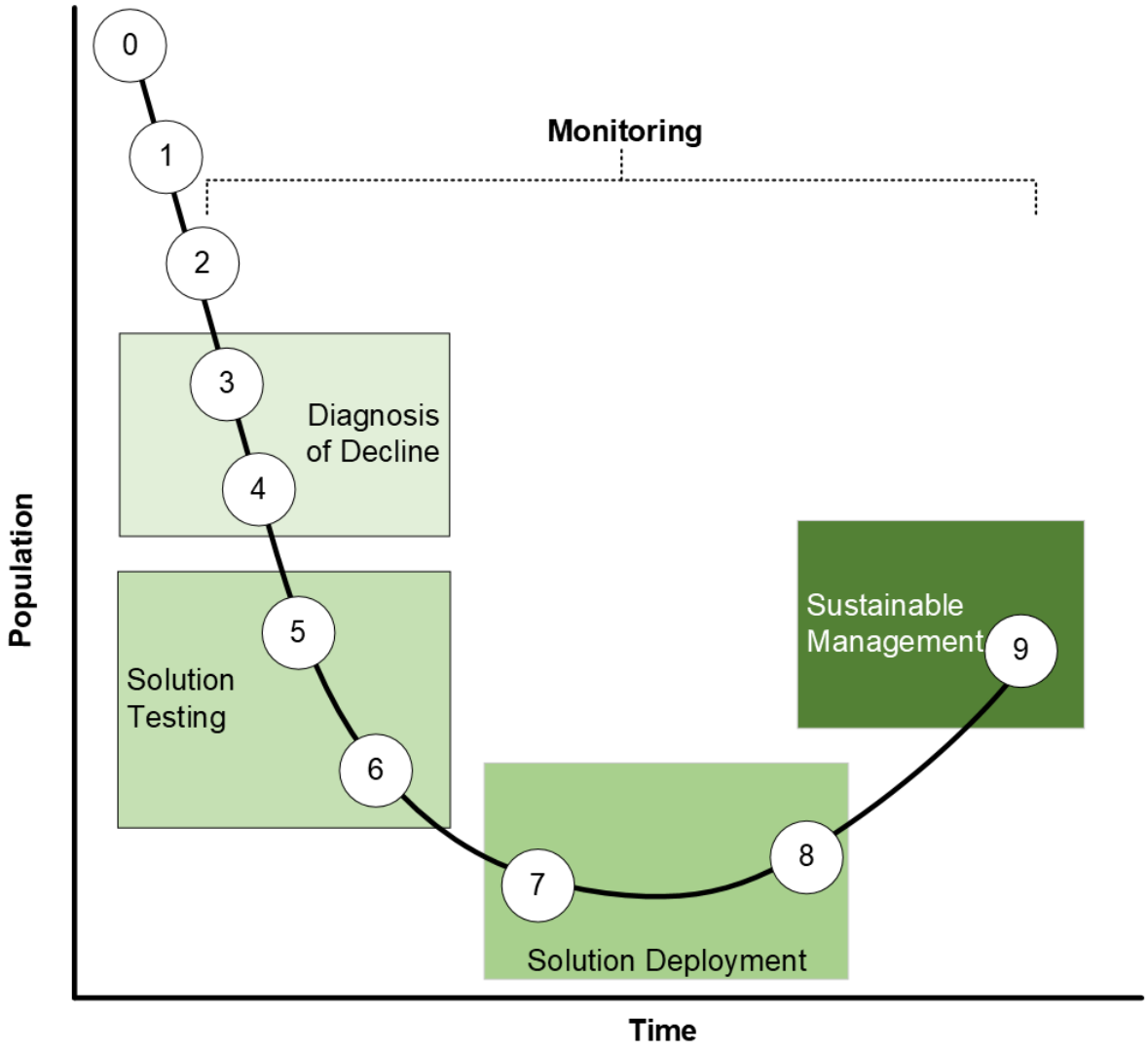
Furthermore, TSRA aims to avoid delegating actions to other organisations or seeking to modify existing plans/strategies/schemes. Experience has shown that such actions can become barriers to recovery, and better outcomes are achieved through partnership working by providing advice and support. However, where Natural England has recently partnered single-species action plans (Appendix 1 lists examples), TSRA aims to align with these.

TSRA identifies new work to improve the status of species. Actions therefore represent the next key steps to progress conservation/recovery. Although existing (and past) measures can be critically important to maintain today's populations, an assumption is made that such work will continue. Hence, 'business as usual' (BAU) actions have been discouraged. Exceptions to this can occur (section 5.6.1).

Species differ in their recovery potential and in the degree of recovery that can be reasonably expected. TSRA aims to differentiate between species with low, and medium-high, recovery potential (section 5.5.2). The purpose of this approach was to help contributors in their consideration of the types of actions necessary and had no bearing on the conservation importance of the species.

Natural England is also developing a Species Evidence Base (SEB) as a support tool for species recovery. It will provide information on species' status, trends, distribution, autecology, climate change vulnerability, associated habitat and pressures, amongst other data. The ambition is for SEB to be publicly accessible and ultimately to provide a platform for TSRA (section 8.2).

Figure 1. The Natural England Species Recovery Curve (SRC). A model pathway of species recovery, with defined steps from 0 to 9. Note that for any particular species, progress can be made on multiple steps concurrently, and not necessary in numerical order. Further information is given in Appendix 2.

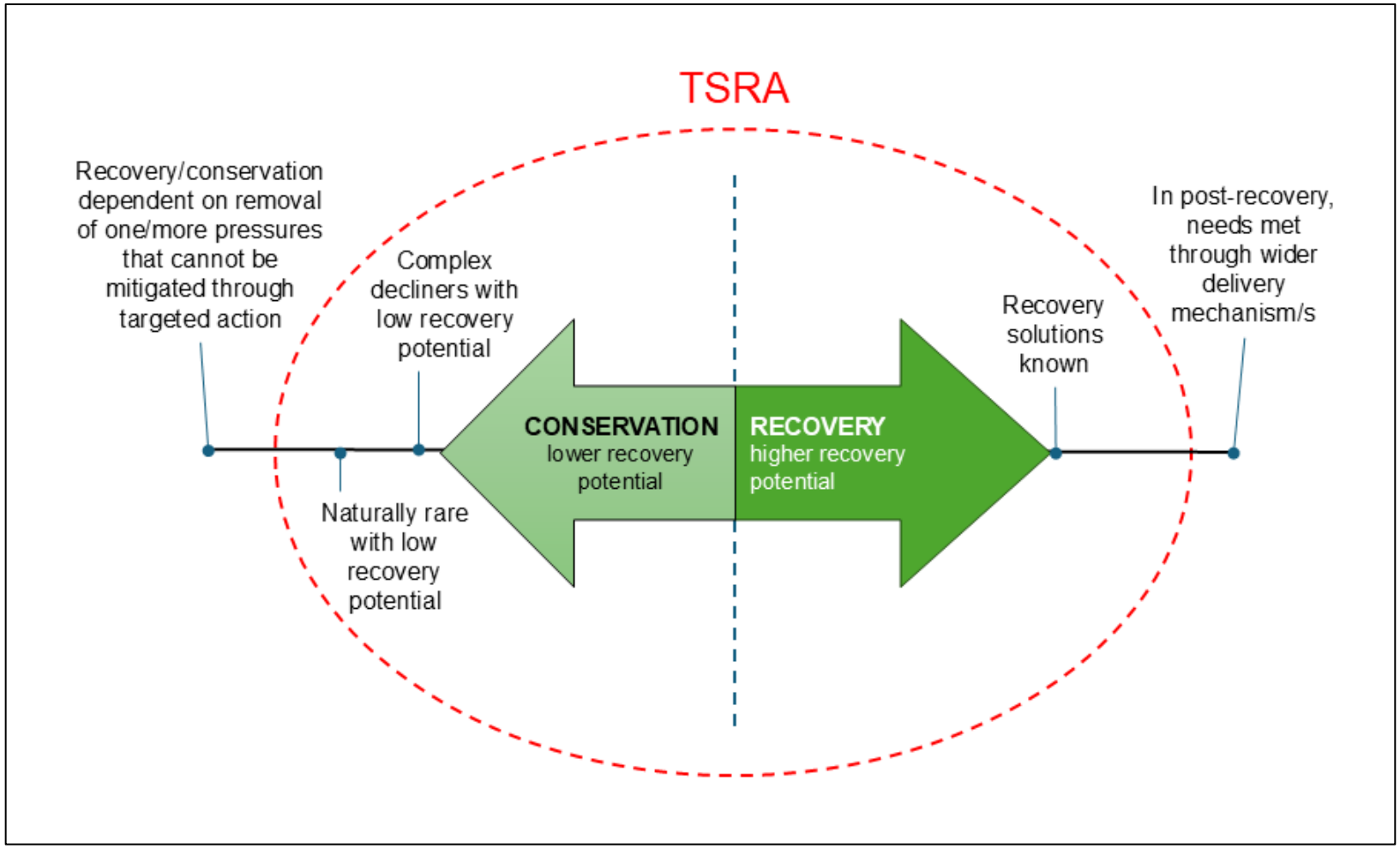


Key

Step 0: No recovery action
Step 1: Taxonomy understood
Step 2: Biological status assessment exists
Step 3: National Monitoring Plan agreed and implemented
Step 4: Autecology and pressures understood
Step 5: Remedial action identified
Step 6: Recovery solutions trialled
Step 7: Best approach adopted at appropriate scales
Step 8: Species recovering
Step 9: Species recovered - target reached

N.B. Steps 1-6 may not necessarily be undertaken sequentially

Figure 2. The scope of TSRA in relation to species conservation and recovery. Key actions can recover populations ('Recovery') or prevent further loss ('Conservation'). Actions that fall outside of TSRA's scope, are those that can be met through wider delivery mechanisms, or where ongoing pressures cannot be mitigated through targeted action.



4.1 Relationship between target and indicator

The measure for the England statutory extinction risk target is the D5 indicator (D5: Conservation status of our native species), the baseline of which was published by Natural England (Wilkins, Wilson & Brown, 2022). A Red List Index is used to monitor the aggregate extinction risk of over 8,000 species across a broad range of taxonomic groups, which effectively tracks the balance of movements between Red List categories for species included.

Simply put, to meet the 2042 target, reductions in extinction risk, e.g. a change from Endangered to Vulnerable, will need to be greater/more frequent than increases, e.g. a change from Least Concern to Near Threatened. No weighting is applied to such changes under the method, hence a shift from Critically Endangered to Endangered is scored the same a shift from Near Threatened to Least Concern.

TSRA addresses only one part of this challenge, aiming to reduce the extinction risk of threatened and near-threatened species, the reintroduction of species already lost from England, and improving the status of additional 'species of principal importance' in England (Section 41 of the Natural Environment and Rural Communities Act 2006): Habitats and species of principal importance in England - GOV.UK.

Preventing the decline of Least Concern (LC) species is the other part of this challenge but, other than LC Section 41 species (section 5.3.1), is outside the scope of the TSRA project. LC species tend to be more common/widely distributed generalists that are probably less well suited to targeted/tailored interventions (e.g. Stroh *et al*., 2014). Moreover, only a proportion of LC species are in decline; many have stable or even increasing populations.

4.2 Climate Change

Climate change is an important pressure on rare and/or threatened species, and increasingly so, to a point where the SRC (Figure 1) may become unviable for some species. TSRA contributors were encouraged to consider the adaptation requirements of species and to set actions accordingly. This was facilitated through the assessment of species' recovery potential (section 5.5.2) and the actions types available (Appendix 3). Moreover, the adaptive approach taken by TSRA allows for actions to be tailored to climate impacts in future and to embrace new or improved adaptation techniques (section 8.3).

5. Method

The method had three main steps:

1. Selecting species for action planning – an evaluation of each species against two criteria (section 5.3).
2. A species assessment – a national overview of the species' recovery status, recovery expectations and monitoring sufficiency (section 5.5).
3. Setting actions – writing up to three, high priority SMART actions per species (section 5.6).

5.1 Base list of species

TSRA's base list has a similar function to the UKBAP 'long list', allowing for the screening of species to identify those in need of action plans. Species with the following statuses were included in the base list:

- Extinct in the Wild (EW)
- Regionally Extinct (RE; including EX where misapplied)
- Critically Endangered (CR; including PE - 'Possibly Extinct')
- Endangered (EN)
- Vulnerable (VU)
- Near Threatened (NT)
- Section 41 species (S41)

Threat statuses originated from GB Red Lists, and species were limited to England only. This was achieved by copying relevant data from the D5 indicator 'Red List Index for England' (Wilkins, Wilson & Brown, 2022). 'Species of Principal Importance in England', as listed on Section 41 of the NERC Act (2006) were added to the list.

For taxa listed on both D5 and S41, it was occasionally necessary to reconcile differences in scientific name and/or taxonomic rank. In such cases, the D5 name was given primacy, as was the rank of species, and the subsumed taxon (e.g. a subspecies) shown in the 'Taxa included / synonym' column of the datasheet. This approach was only possible for subspecies that were the sole representatives of the taxon in England (i.e. no other subspecies existed). If two or more subspecies were native to England, all were included in the base list. Note that all taxa listed in S41 as subspecies (including those where a subspecies has been subsumed) are flagged in the datasheet in the Section 41 column, as 'S41 (subsp.)'.

The base list comprised 2,113 taxa in total, spanning over 40 taxonomic groups (Appendix 4, and summary in Figure 3) and represents a range of ecosystem types (Figure 4). The reason for inclusion in the base list is summarised in Figure 5.

Figure 3. Taxon coverage of the TSRA base list. The base list contained 2,113 species, across a range of taxonomic groups.

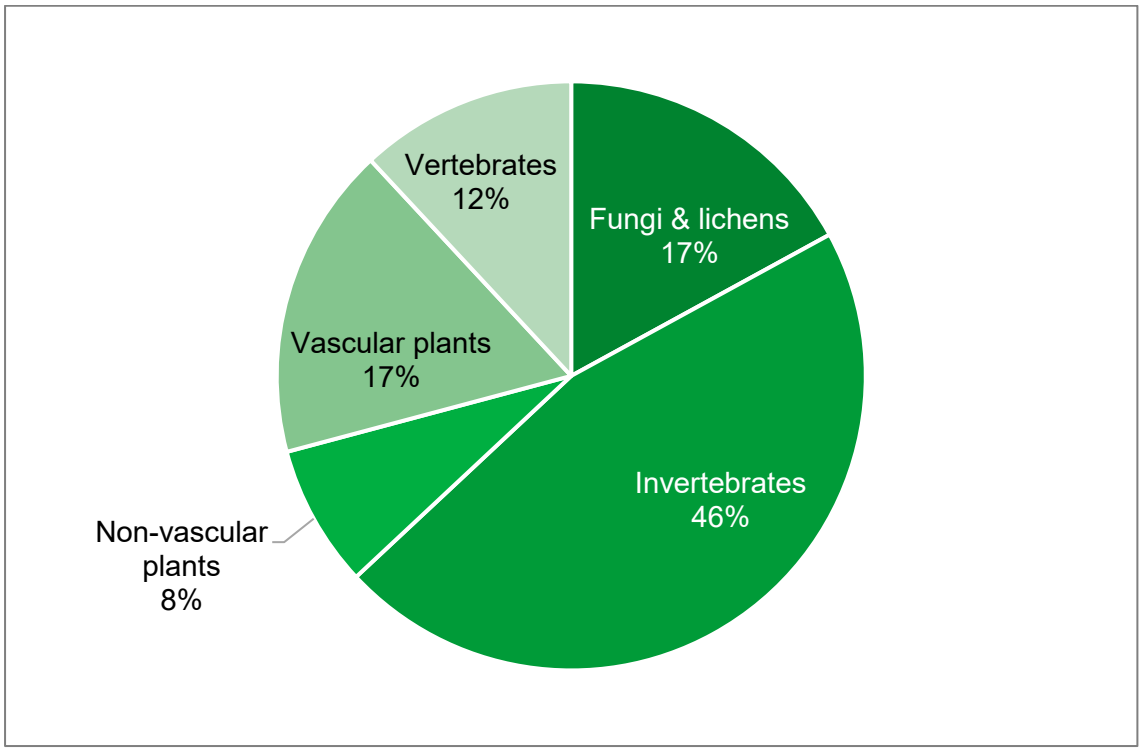


Figure 4. Broad ecosystem of species. Species in the TSRA base list belonged to the following ecosystem types (n=2,113).

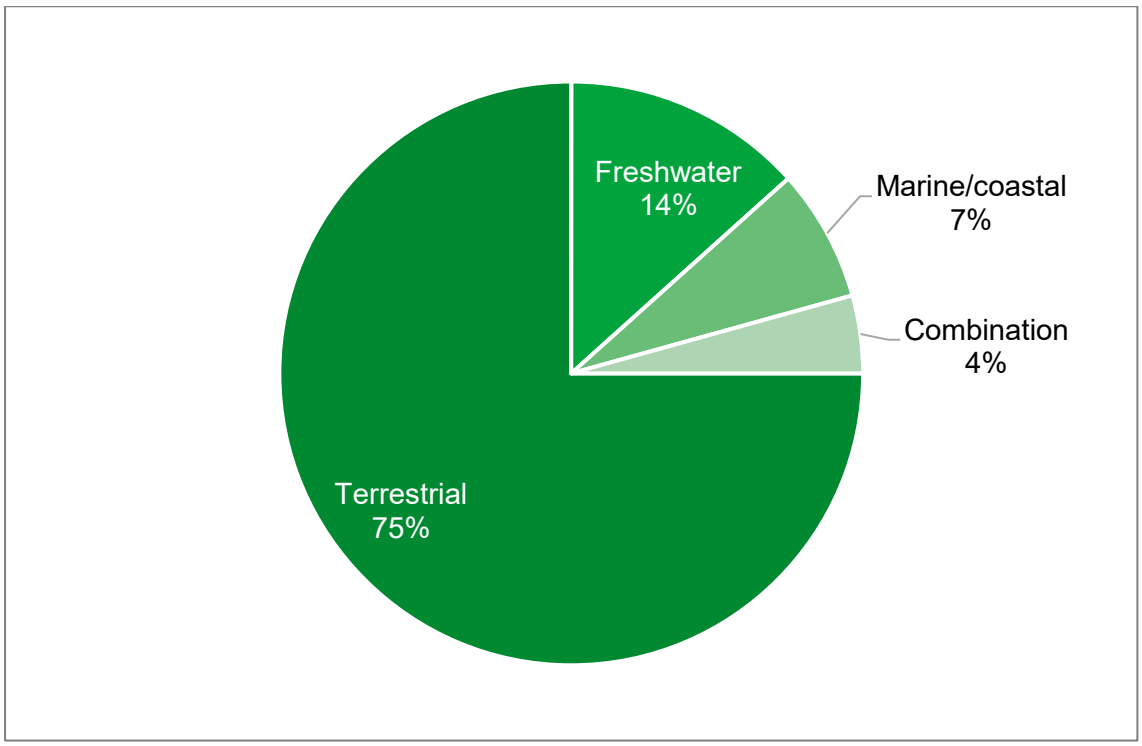
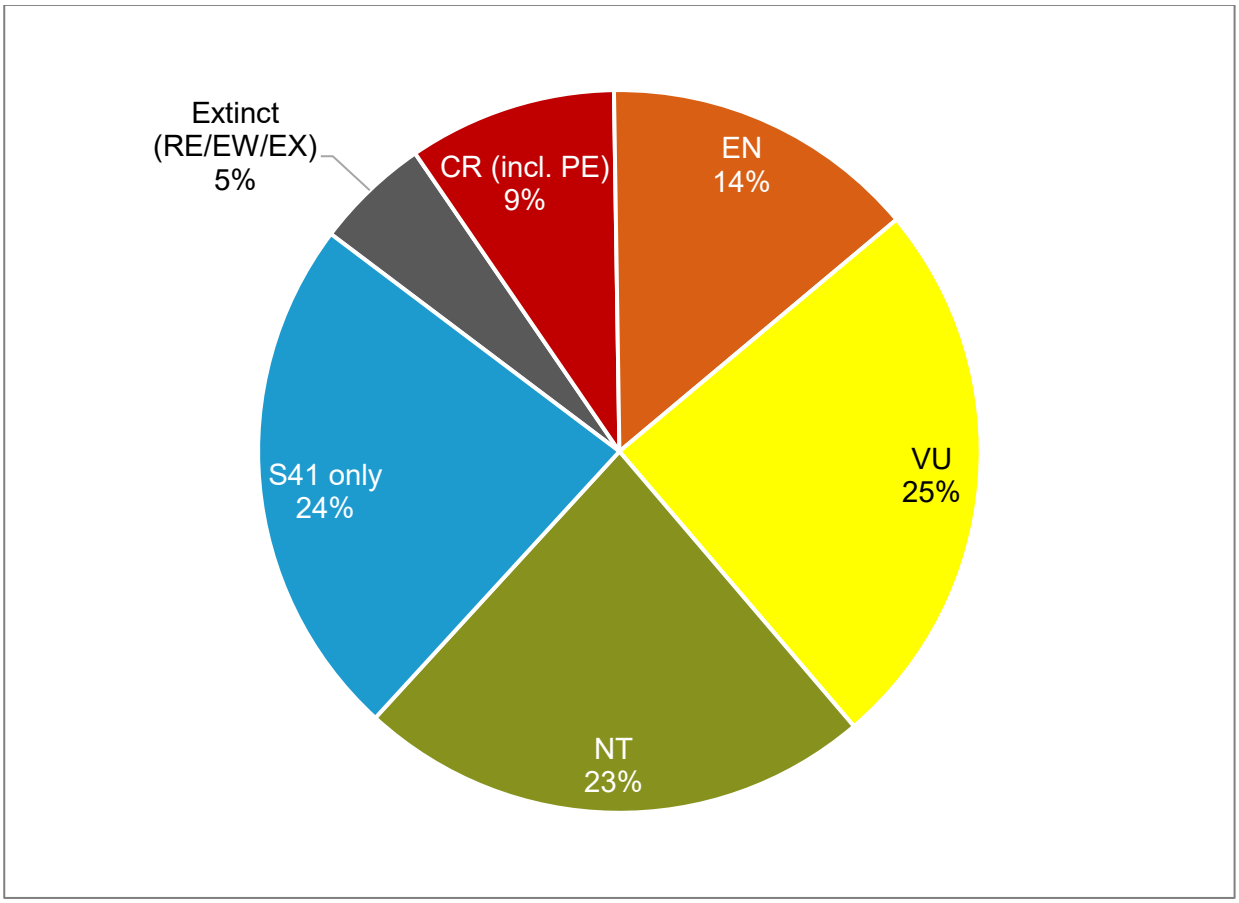


Figure 5. Species conservation status responsible for the composition of the TSRA base list. Extinct = sum of Regionally Extinct (RE), Extinct in the Wild (EW) and globally Extinct (EX); CR = Critically Endangered; PE = Possibly Extinct; EN = Endangered; VU = Vulnerable; NT = Near Threatened; S41 only = NERC Section 41 (not Red List assessed, or assessed but excluded from D5, or Least Concern); n=2,113.



5.1.1 Nomenclature

Species can have multiple scientific and common names. To aid searches, these appear in up to four columns in the datasheet (Taxon scientific name, English name, Taxa included / synonym, and UKSI (UK Species Inventory) Recommended Name). The 'Taxa included / synonym' column provides alternative scientific and common names, as well as taxa subsumed by the project – e.g. subspecies (section 5.1). UKSI fields were updated using a June 2025 version of UKSI, which included vascular plant names according to Stace (2019) (Natural History Museum, 2025).

The English name shown mainly follows the UKSI well-formed, recommended and verified name. However, in some cases other names have been used on the advice of contributors or reviewers, or due to the S41 listing. Additional English names may be given in the 'Taxa included / synonym' column.

Full definitions of the taxonomy fields are given in the 'Datasheet key' tab (worksheet). Additional comments may be given in the 'Notes on taxonomy/listing' column of the datasheet.

5.1.2 Marine species

The inclusion of the Section 41 list helped to address taxonomic gaps in Red List coverage, in particular, for marine taxa. To date, very few marine groups have been Red List assessed at GB level. The main marine groups included in the base list are: mammals, fish, birds, molluscs, seaweeds, maërl, seagrass, cnidarians (anemones, jellyfish, sea-fans, corals), crustaceans, and turtles.

TSRA users should also refer to the English Seabird Conservation and Recovery Pathway (ESCaRP). In recognition of the pressures impacting on seabird populations, including diseases such as Highly Pathogenic Avian Influenza, ESCaRP provides a set of 74 actions designed to bring about seabird recovery in England (Natural England, 2024). Note that for ESCaRP species that met the TSRA action-planning criteria, species-specific actions have been included in the dataset.

5.2 Workflow

Species evaluation and action planning took place over two financial years (2023-24 and 2024-25), with some review work continuing into Quarter 1 of 2025-26. Due to the large number of taxa involved, work was phased into Tranche 1 (T1) and Tranche 2 (T2).

In year 1, external authors were commissioned to evaluate and draft actions for 1,011 taxa across 29 taxon groups. These T1 outputs were subject to external peer review, or taxon group workshops (Table 1), mainly for the purposes of QA and to build consensus amongst partners. The workshops, in particular, were considered by Natural England to be immensely valuable, involving in-depth discussions on species requiring action planning and their proposed key actions.

Table 1. Tranche 1 workshops. The workshops reviewed qualifying species, refined draft actions and built consensus.

Workshop	Date	Attendance
Bats – big bats and pipistrelles	19th June 2024	Bat Conservation Trust, Natural England, and 21 national experts
Bats – Myotis and horseshoes	3rd July 2024	Bat Conservation Trust, Natural England, and 18 national experts
Mammals – terrestrial	19th July 2024	Mammal Society, Natural England, and 8 expert NGO's
Mammals – marine	12th August 2024	Mammal Society, Natural England, and 6 expert NGO's

Workshop	Date	Attendance
Butterflies	12th September 2024	Butterfly Conservation, Natural England, and 1 academic partner
Moths	10th September 2024	Butterfly Conservation, Natural England, and 2 academic partners

In year 2, contributors were sought for T2 which comprised the remaining 1,102 species across 25 taxon groups. Unlike T1, T2 outputs were not reviewed externally in most cases. This was justified on the basis that: 1) species in T2 were generally less well known or data-poor, hence there was a lack of experts to undertake peer-reviews; 2) many T2 contributors had already been involved in T1 and therefore were familiar with TSRA methodology, so less likely to make errors.

Both tranches were subject to internal review by Natural England species specialists (technical content) and the TSRA team (protocol and data gaps). Although these and external peer reviews generated a great deal of correspondence between reviewers and contributors, it was felt the results were much improved as a result. On the rare occasion when it was not possible to find consensus on species qualification, or particular actions, Natural England specialists and the TSRA team made the final judgement over content.

Unfortunately, due to a lack of availability of national experts, over 200 lichens in the base list were not evaluated and therefore have been excluded from the spreadsheet. These will be a priority to cover at the next TSRA update.

5.3 Selecting species for action planning

Two criteria (questions) determined whether a species could qualify for action planning. Contributors were required to justify their Yes/No response in each case, which was as far as possible evidence based.

Eligibility for action planning is expected to change over time as evidence improves, and the status of species change. An adaptive approach has been taken whereby Q1 and Q2 responses can be changed at future updates.

5.3.1 Action-planning criteria

Q1. Does the species need conservation or recovery in England?

This question concerned the current conservation/recovery needs of the species in England. Contributors were asked to consider the status and trend of the England population of each species and to justify their Yes/No response. Justifications were as far as possible evidence-based (with sources cited), although expert opinion was also permissible.

For S41 species with a Least Concern status at both GB and England scales, there was a presumption the Q1 criterion would not be met. However, exceptions could be made for a species showing:

- Gradual long-term decline, or unrecovered historical loss, that was not reflected in the Red List assessment; or
- Conservation dependency where inaction could risk conservation gains; or
- An outdated or questionable LC status.

Rationale: Since the base list was largely drawn from GB Red Lists, it included species that had different threat statuses at England scale (e.g. Stroh *et al*., 2014). Furthermore, some of the GB Red Lists were over 10 years old, hence GB statuses could have changed (prior to Red List reassessment). The Section 41 list contained over 350 species that had yet to be Red List assessed. Moreover, this list was nearly 20 years old.

Q2. Does recovery/conservation depend on species-specific actions?

This question concerned the need for specific measures directed at the species. 'Species-specific actions' were defined as interventions tailored or targeted to the species that were over and above broader nature recovery and habitat measures (i.e. other EIP23 targets and commitments). Examples of species-specific actions included: status reviews, research, solution testing, bespoke management, and *ex situ* work. There was no requirement for actions to be unique (across TSRA species).

Justifications were needed to explain why general/widespread nature recovery measures would fall short of promoting recovery. For example, the species might have particular habitat requirements that were rarely met by standard management regimes; or the species might have poor dispersal and/or occupy few sites such that it was unlikely to be able to take advantage of suitable habitat elsewhere.

When too little was known of the species to answer the question, proxy considerations could be used including whether the species was likely to be:

- a specialist (occupying a narrow niche)
- rare (occupying an uncommon niche)
- at an early SRC step (<Step 4)

A precautionary 'Yes' response was advised when in doubt, so that the species could go forward for action planning. However, a requirement for monitoring *per se*, was not considered a strong enough justification.

Rationale: The 2023 Environmental Improvement Plan contains many commitments and targets of great relevance to species recovery. To avoid creating dependencies and duplication, TSRA took a species-centric approach to action planning, chiefly built around the Natural England Species Recovery Curve (Figure 1). This required identifying practical and implementable action directed at the species, rather than broader measures focussing on habitats, landscapes, or a reduction in pressures. Where constraints beyond the SRC were acting, these were assessed under Recovery Potential and details recorded in

comments, including any policy issues. In taking this approach, actions could be treated as building blocks for species recovery projects.

5.4 The value of untargeted habitat management

A supplementary question (Q3) concerned the suitability of habitat management more broadly. This was not a criterion for action planning and a response was not required if the species had failed to qualify under Q1 and/or Q2.

Q3. At a landscape scale, would the species benefit from untargeted habitat management to increase habitat mosaics, structural diversity, or particular successional stages?

The 'benefit' was defined as in addition to any TSRA actions. Only a 'Yes' response required justification - e.g. disturbed bare ground needed.

This question concerned the management of terrestrial/wetland habitats. Specifically, it asked whether prescriptions generating more habitat mosaics (greater habitat heterogeneity, including bare/disturbed ground, and/or variance in vegetation structure) would aid recovery/conservation of the species regardless of the habitat's proximity to extant populations. In other words, it tested the 'build it and they will come' notion. Because timeframe was key here, it was suggested to consider this in the context of the next 10 years.

The question applied as much to the general countryside as it did to specific habitat types (including Priority Habitats). Q3 was not relevant to every species and did not cover benefits from reducing environmental pressures, nor extend to truly aquatic habitats and the marine environment.

Rationale: A lack of particular successional stages, habitat structure, or dynamism at landscape scale has been implicated in the decline or poor recovery of some species (Davies *et al.* 2007, Oliver *et al.* 2010, Calladine *et al.* 2013, Thomas *et al.* 2015, Seibold *et al.* 2016, Habel *et al.* 2019, Rivers-Moore *et al*. 2020). Natural England's 'Mosaic Approach' was developed to address this need (Webb *et al.* 2010; Natural England, 2013). However, mobility, dispersal capacity, population status (rarity, fragmentation, etc.) and other factors may prevent or limit a species from taking advantage of suitable habitat wherever it exists in the landscape.

5.5 The species assessment

For species that qualified for action planning (a 'Yes' to Q1 and Q2), a dedicated species assessment was required, comprising three fields with dropdowns (Appendix 3) and an optional (free text) comments field.

The species assessment aimed to inform the actions by assessing: 1) current SRC step, 2) recovery potential/expectation, and 3) national monitoring resource.

5.5.1 Current SRC step

This was defined as the Species Recovery Curve step (Figure 1) considered to be the most significant blocker or barrier to recovery of the species at present in England. This concerned the whole of the English population (for extant species).

Earlier guidance asked for the main SRC step attained (the prevailing step of the species at national level), but this was changed after feedback from contributors. Movement through the SRC steps is not necessarily sequential. Species can make progress on multiple steps to differing degrees, reflecting projects completed or ongoing. Urgency can also be a factor in the face of rapid declines, when it may not be possible to complete research projects, for example, before initiating conservation action on the ground.

5.5.2 Recovery potential / expectation

Species differ in their recovery potential and in the degree of recovery anticipated. Species with low recovery potential tend to be naturally rare, or facing overwhelming intractable pressures, or carrying varying degrees of extinction debt, while those with medium-high potential tend to be less rare, better understood ecologically, and their recovery pathways more known and tested (Figure 2). Contributors were asked to select a reason for low recovery potential (Appendix 3).

This assessment concerned the current status of the species and was to help inform the key actions and their overall objective. For example, actions for a species with low recovery potential might focus more on protecting and conserving extant sites, supported by *ex situ* work to augment populations and/or as a safeguard, whereas species with medium-high recovery potential could draw from a wider array of plausible (and more ambitious) actions.

5.5.3 National monitoring resource

National surveillance and recording schemes contribute to varying degrees to the monitoring requirements of threatened species. This field assesses the current sufficiency of these schemes in England for the species, together with ad hoc/opportunistic recording. Contributors looked at this in the context of SRC Step 3 which concerns the implementation of a sufficiently sensitive species monitoring plan (Appendix 2).

Structured schemes aim to apply a standardised sampling approach at sufficient scale to allow for annual assessment of national population trends. Opportunistic recording is by definition unstructured, so more prone to subjective bias, although may contribute to a recording scheme or project. Further information is available on the JNCC website: Terrestrial monitoring schemes | JNCC - Adviser to Government on Nature Conservation.

Contributors chose from dropdown options (Appendix 3). Targeted species monitoring was not an option here because it was species-specific, so could be a key action. Actions

specifying the creation of new, or modification of existing, national surveillance/recording schemes for taxon groups, were considered beyond the scope of TSRA.

The treatment of actions involving monitoring is covered in section 5.6.2.

5.6 Setting actions

Each species was assigned up to three species-specific key actions, which were the next steps in the recovery or conservation of the species, with a view to future updates when new actions could be introduced. For Section 41 species, contributors were asked to review the actions in the S41 actions spreadsheet (Natural England, 2013/18) and could either revise these or retain them unaltered if they were still considered valid.

Each key action has seven datasheet fields:

- Action text
- SRC step action addresses
- Action type
- Duration
- Scale of implementation
- High priority site/s
- Action comments

To gain a full understanding of an action, it is necessary to read all associated action fields in the datasheet – e.g. for Key Action 1, read all the above fields labelled KA1. Important details can be included under action comments.

5.6.1 Action-writing protocol

Action text was required to have the following characteristics.

Species-specific

As defined under Q2 (section 5.3.1), actions had to be directed towards the species in question, rather than general habitat or wider nature recovery. However, there was no requirement for actions to be unique (across TSRA species).

Generic management approaches were acceptable where detailed prescriptions were not known due to evidence gaps but actions such as “manage each site appropriately” were unimplementable due to lack of detail.

Practical

Actions needed to be practical in nature, as opposed to focusing on policy. This encompassed not only bespoke management (e.g. SRC step 7) but every SRC step.

Targeted actions to mitigate pressures or threats to the species at local level were in scope, while actions calling for widescale pressure reduction were not.

SMART

Contributors were asked to make actions as SMART as possible. On the basis that ‘actions’ are different to‘ targets’, this was defined as:

- **Specific** – sufficiently detailed to be implementable without misinterpretation or recourse to a specialist.
- **Measurable** – can be determined whether the action has been completed or not, or action progress can be quantified.
- **Achievable and Realistic** – considered deliverable in the timeframe below.
- **Time-bound** – periods specified in the ‘Duration’ column (dropdown options).

Single SRC step

Each action was linked to just one SRC step. Single-topic actions were encouraged – e.g. a research action addressing only one research question. However, there is a risk of conflation whereby multiple actions could be combined under one key action. By ensuring each action addressed a single SRC step, this risk was reduced.

Two additional action types were eligible which lacked dedicated SRC steps:

- Site protection – especially relevant to the conservation of species with low recovery potential.
- Legal protection – especially relevant to species suffering from targeted exploitation. This excluded legal reform.

Importantly, both the above are subject to separate Natural England procedures and cycles, hence such actions should be considered advisory – e.g. special protection under Schedules 5 or 8 of the Wildlife & Countryside Act (1981) is subject to quinquennial review.

Progressive

Actions should normally go beyond BAU, but exceptions were made in certain circumstances:

- Periodic cyclical actions, e.g. the need for an updated Red List.
- Conservation dependency, e.g. a recurring maintenance action that prevented local extinction of a species.
- Work to complete an action already underway, e.g. the continuation of a reintroduction project.

Further requirements

Where possible, each qualifying species should have a full set of three key actions (rather than one or two).

Additional actions proposed (i.e. beyond the three-action limit), were considered lower priority and could be noted in species comments. These proposed actions could be

revisited at TSRA updates and become live should other actions be completed or downgraded in priority.

Actions should also:

- Use non-technical language.
- Ideally be no more than several sentences (but no word limit was set).
- Include a rationale (but this was optional).
- If site-specific, be directed at the species (rather than site condition or habitat-based measures).
- Aim to align with ongoing single-species action plans that have been partnered by Natural England (Appendix 1).
- Not make direct requests for resources or funding.
- Avoid using the word 'ensure' unless details of the activities/steps needed were included – e.g. 'Ensure species X has sufficient foraging and breeding habitat across its range' was considered insufficient unless combined with how this would be achieved – e.g. '…by establishing broadleaf woodland adjacent to extant sites'.

Recovery constraints resulting from the action writing protocol were noted in species comments.

The examples in Table 2 show one suitable format: a brief statement as context/justification, followed by the action. A longer list of 'exemplar' actions by action type was shared with contributors to build understanding of what was needed.

Table 2. Examples of key actions and their associated SRC steps.

Key action	Associated SRC step
Recent evidence suggests this species is an aggregate of three taxa. Carry out research using morphometric/DNA techniques to resolve taxonomy and identification traits.	1. Taxonomy established
Current GB Red List status is Data Deficient. Conduct a status review through a programme of targeted surveys, aiming to clarifying its Red List status at GB and England scales.	2. Biological status assessment exists
The exact causes of this rapidly declining taxon are unknown but are suspected to be pesticide related. Carry out a correlative study across extant sites and investigate direct impacts on the species.	4. Autecology and pressures understood
Conservation techniques for this species have varied across the UK and in northern Europe. Conduct a	5. Remedial action identified

Key action	Associated SRC step
literature review to identify the recovery solutions with greatest potential.	
Recent advances in reintroduction techniques show promise for this species. Conduct a controlled trial across parts of sites/populations to compare efficacy, strengths and weaknesses.	6. Recovery solutions trialled
Although recovery methods are known, take-up of these has so far been limited. Produce an illustrated practical guide for land managers on how to manage for this species and its habitat.	7. Best approach adopted at appropriate scales

5.6.2 Monitoring actions

Whilst the project recognised monitoring as an essential part of species conservation and recovery work, it was implicit in many SRC steps and thus actions. In some cases, national monitoring schemes also played a role, the sufficiency of which was tested in the species assessment (section 5.5.3).

Given the three-action limit per species, standalone monitoring actions were discouraged unless targeted monitoring (SRC step 3) was a clear priority – e.g. a rare species with low recovery potential where the aim was to maintain populations and prevent local extinctions.

Although actions to set up new national recording schemes were beyond the scope of TSRA, trialling monitoring methods to establish a representative network of monitoring sites was considered eligible if England focussed. Actions of this type sat under SRC step 3 which is about designing and implementing a national monitoring plan for the species. Note the distinction with targeted status surveys to inform Red List assessment, which sit under SRC step 2.

Where monitoring was considered an implicit part of the action, the action should be linked to the main work area, rather than SRC step 3. For example, if the action was about autecological research which involved some field monitoring, the action would link to step 4. In such cases, text describing monitoring requirements could be added to the action wording.

5.6.3 Action scale, location and duration

Although TSRA takes an England-wide perspective, the scale at which actions need to be implemented varies considerably. This is shown in the spreadsheet in the ‘Scale of implementation’ column for each action.

Site names (or locations or areas) where the action was considered a high priority to take place appear in the 'High priority site/s' column, although this field was optional. On the advice of Natural England species specialists, details of confidential sites have been redacted. Furthermore, to protect species at risk of targeted collection or disturbance, named locations of taxa in the National Biodiversity Network 'England sensitive species list' (NBN Trust, 2023), have either been deleted, or blurred, prior to publication.

When completed, Natural England's Species Evidence Base will be an additional tool to aid local delivery of actions, by providing summary distributional data for TSRA base list species across eight English regions (North East, North West, Yorkshire and The Humber, East Midlands, West Midlands, East Anglia, South East, South West).

Action duration is an estimate of the lifespan of each action in year bands; it does not indicate when actions should start or finish. Moreover, contributors were not required to put actions in chronological order, or order of priority, although sometimes this was evident – e.g. Action 2 was dependent on the outcome of Action 1.

5.7 Limitations of method

The following summarises the main project limitations.

Base-list limitations

The rationale and criteria for species inclusion in the base list (section 5.1), resulted in a number of limitations:

1) GB Red Lists produced after 2022 were not incorporated in the base list but have been referred to by contributors during species evaluation, e.g. Brodie *et al*. (2023). Note that post-2022 Red Lists will be a consideration when TSRA is updated in future.

2) Red List assessments at other geographic scales were not used. Although the base list would have been expanded if the four England Red Lists currently available (Stroh *et al*., 2014; Mathews & Harrower, 2020; Foster *et al*., 2021; Nunn *et al*., 2023.), and European and global Red List statuses, had been incorporated, it was decided to maintain alignment with D5 (note that the treatment of England Red Lists is discussed in Wilkins, Wilson & Brown (2022)). Importantly, however, England Red List status (and statuses at other scales) could be used by contributors in response to Q1.

3) England/GB endemics, near-endemics, and species for which we have internationally important populations, were not systematically included although many were by virtue of their S41 listing or GB Red List status.

4) Red List assessments have shown that a proportion of the c.6,500 LC species in D5 are in decline. LC taxa were excluded on grounds that they were not yet threatened with extinction, were more likely to benefit from widescale measures than bespoke

action, and no comprehensive evaluation of LC decliners currently existed. An exception was made for S41 LC species, on the presumption that some remained England priorities and were conservation dependent (section 5.3.1).

5) Data Deficient taxa were excluded, other than a small number that were S41 listed (n=9). The purpose of exclusion was to align with the D5 'Red List Index' but should not be interpreted as a lack of conservation need: successful Red List assessment depends on sufficient survey data and taxonomic research going ahead. A list of England Data Deficient species (derived from GB Red Lists) can be found in Wilkins, Wilson & Brown (2022).

6) Changes in taxonomy since D5 (2022) and S41 (2006) publications were seldom accounted for when compiling the base list but were considered during assessment against the criteria and for the species assessment. Synonymisation will be further reviewed at the next TSRA update.

Criteria limitations

1) Although much guidance was issued, interpretation of the criteria (Q1 and/or Q2) varied. This may have been due, in part, to the brevity of datasheet headings representing criteria descriptions. In most cases, misinterpretation was caught by reviewers and subsequently corrected.

2) A lack of species data or evidence for Q1 or Q2 hindered responses and justifications. Further guidance was introduced for Q2 to make allowance for this (Section 5.3.1).

Action limitations

To gain a full understanding of action scope, please refer sections 5.3 and 5.6. As listed below, certain types of action were considered beyond the reach of TSRA due to its overall objective and approach (section 4).

1) *Wider nature recovery actions concerning pressures, habitats or landscapes*. TSRA takes a highly prioritised species-focussed approach (see Section 4 for rationale). It can do little for species where the only solution is a reduction/removal of one or more pressures at source and where local mitigation is impracticable.

2) *Actions concerning policy, planning, regulation, delivery mechanism design, or legislative reform*. TSRA aims to produce sets of practical and actionable measures that can be developed into species recovery projects. Understanding the requirements of species can help improve policy etc. Policy constraints are considered in the assessment of Recovery Potential (section 5.5.2) and can be specified in species comments.

3) *Advocacy or campaigning actions, particularly if directed at other organisations*. This did not include educational and awareness-raising actions, or land manager advice and training, both of which were in scope.

4) *'Lead partners' were not assigned to actions or species.* The TSRA baseline is intended to encourage collaboration and cross-taxa working to develop projects.

5) *Conflated actions*. The TSRA method aimed to establish a link between each action and the SRC step it was delivering towards, thus aiding monitoring and evaluation. Where actions spanned multiple SRC steps, contributors were required to split the content into two or more actions. An exception was made for species monitoring, because it was considered intrinsic to many recovery curve steps (Figure 1).

6) *Action typology issues.* Although TSRA guidance included action-type definitions and cross-references, contributors found some categories difficult to apply. For example, it was difficult to differentiate between 'Ex situ conservation' and '(Re-) introduction', or 'Advice & support' and 'Education/awareness raising'. Confusion with fish arose because removal of barriers to aid migration could be recorded as 'Pressure mitigation', although improved connectivity had been included under the 'Habitat creation' definition. Such instances were accepted limitations of method, and efforts would be made to improve the typology in future.

6. Spreadsheet user guide

The accompanying spreadsheet (JP065 Threatened Species Recovery Actions - 2025 baseline.xls) has been designed to be as self-contained as possible and therefore the following can be considered supplementary guidance. Full descriptions of each worksheet (tab) are given in the 'Table of Contents' tab.

- The 'Datasheet' tab contains the main dataset. This comprises fields for taxonomy & status, the action-planning criteria, key actions 1 to 3 (as required), and a range of additional information for each species. Definitions for all datasheet fields are given in the 'Datasheet key' tab.

- The 'Key action summary' tab lists only qualifying taxa and their actions for simple lookup and analysis. The actions of each species are shown in adjacent rows in a single column.

- The 'References' tab lists sources cited in the datasheet (note that the References section in this report, only covers the report).

Below, are some user-friendly suggestions on how to utilise the data.

6.1 How to look up a species in the 'Datasheet'

Note that TSRA is not a spatial dataset, it will not tell you which species are present in certain geographic areas/locations but, where relevant, details of High Priority sites are given where actions should take place (section 5.6.3).

In the spreadsheet, select the ‘Datasheet’ tab.

- To find a specific species, or species group:
    - You can simply use CTRL+ F to find a species, or
    - Filter Columns A, B, C, D or E to display all the species of a particular taxon group, or to select specific taxa to show.
- To list all taxa with a particular rank – e.g. subspecies, GB Red List status – e.g. NT (Near Threatened), or in the D5 indicator or Section 41, filter columns J, L, M and N, respectively.
- Each species (taxon) was assessed against two criteria (Q1 and Q2 in ‘Datasheet’ tab) which determined whether the species went forward for action planning. To filter the dataset to show which species in the TSRA base list qualified for actions, filter columns Q and S to ‘Yes’ only. The resultant list of species will have one, two or three actions each. Species with a ‘No’ in either (or both) column Q or S will not have any actions at all but have been retained in the datasheet so that justifications for failing the criteria are apparent (in columns R and T). Note that the ‘Key action summary’ tab contains a simplified list of all qualifying species, and their actions split by row for ease of lookup.
- Action text is found in columns AA, AL and AW. Often ‘Action comments’ fields will have useful additional information pertaining to the action.

6.2 Examples of how the dataset can be used

To use the datasheet to create a list of species with actions of a certain type, e.g. all species with actions classed as ‘scientific research’:

1) Firstly, filter columns Q and S to ‘Yes’
2) If you are only interested in species of a certain group – e.g. plants, filter columns A-C, accordingly.
3) Next, filter ‘Action type (KA1)’ (column AC) to ‘scientific research’. The resulting list will show all taxa with a scientific research action within ‘Key Action-1’.
4) Repeat this for each of the remaining ‘Action type’ columns (KA2 and KA3), to get a full sense of all actions of this type across Key Actions 1, 2 and 3 (remember to switch off the previous ‘Action type’ filter each time).

- Using a combination of filters such as the above, can be useful when developing multi-species projects. For example, it is possible to create species lists for collaborative *ex situ* collection planning by filtering action type to reintroductions and *ex situ* conservation.

7. Summary results

7.1 Action-planned species

Of the original base list, a total of 1,908 species across 41 taxonomic groups (UKSI informal group) were evaluated against the criteria. Of these, 73% (1,384) met the criteria and were action planned (Figure 6). Comparing the proportions of Figure 6 with those of the base list (Figure 3), most groups are similar, apart from the fungi and lichens group which has 8% fewer species qualifying for actions. This is mainly because 205 lichens could not be evaluated prior to publication (rather than a high proportion of that group failing the criteria).

Figure 6. Species qualifying for action planning. Taxonomic breakdown of species in the TSRA base list which met the criteria for action planning (n=1,384).

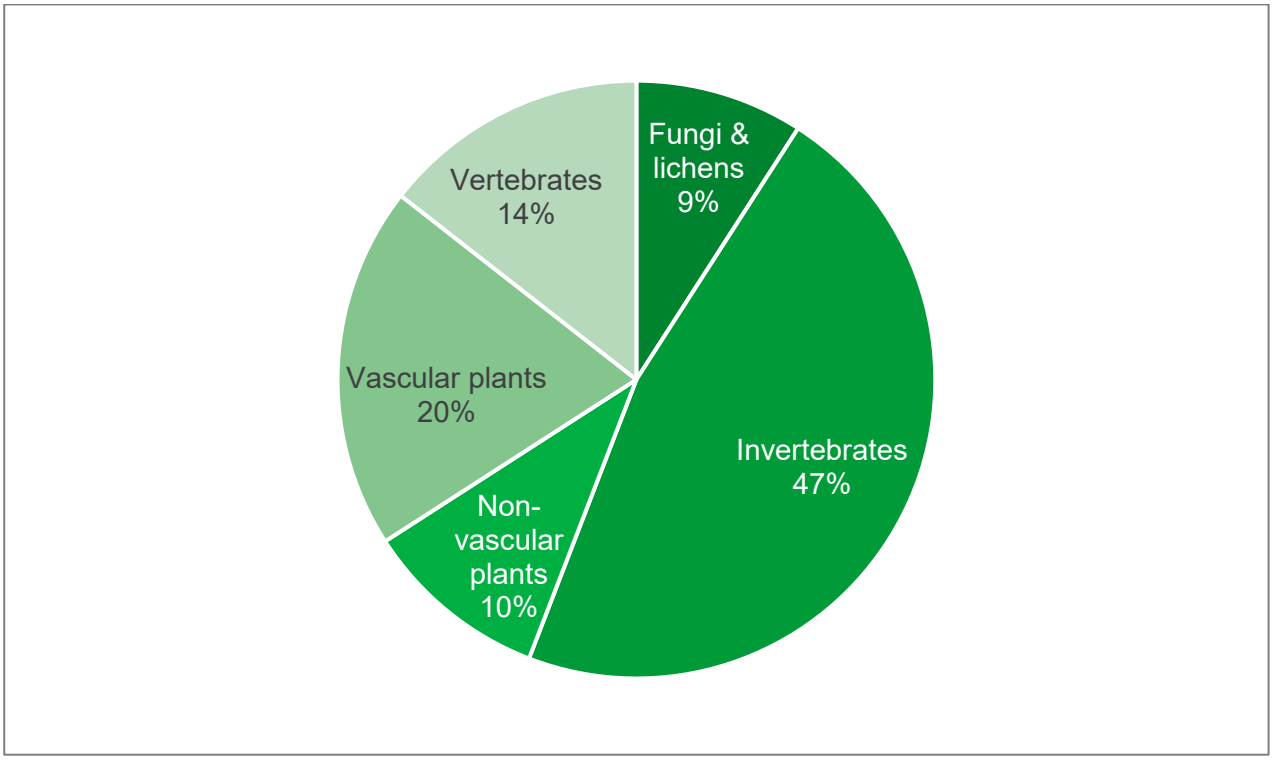
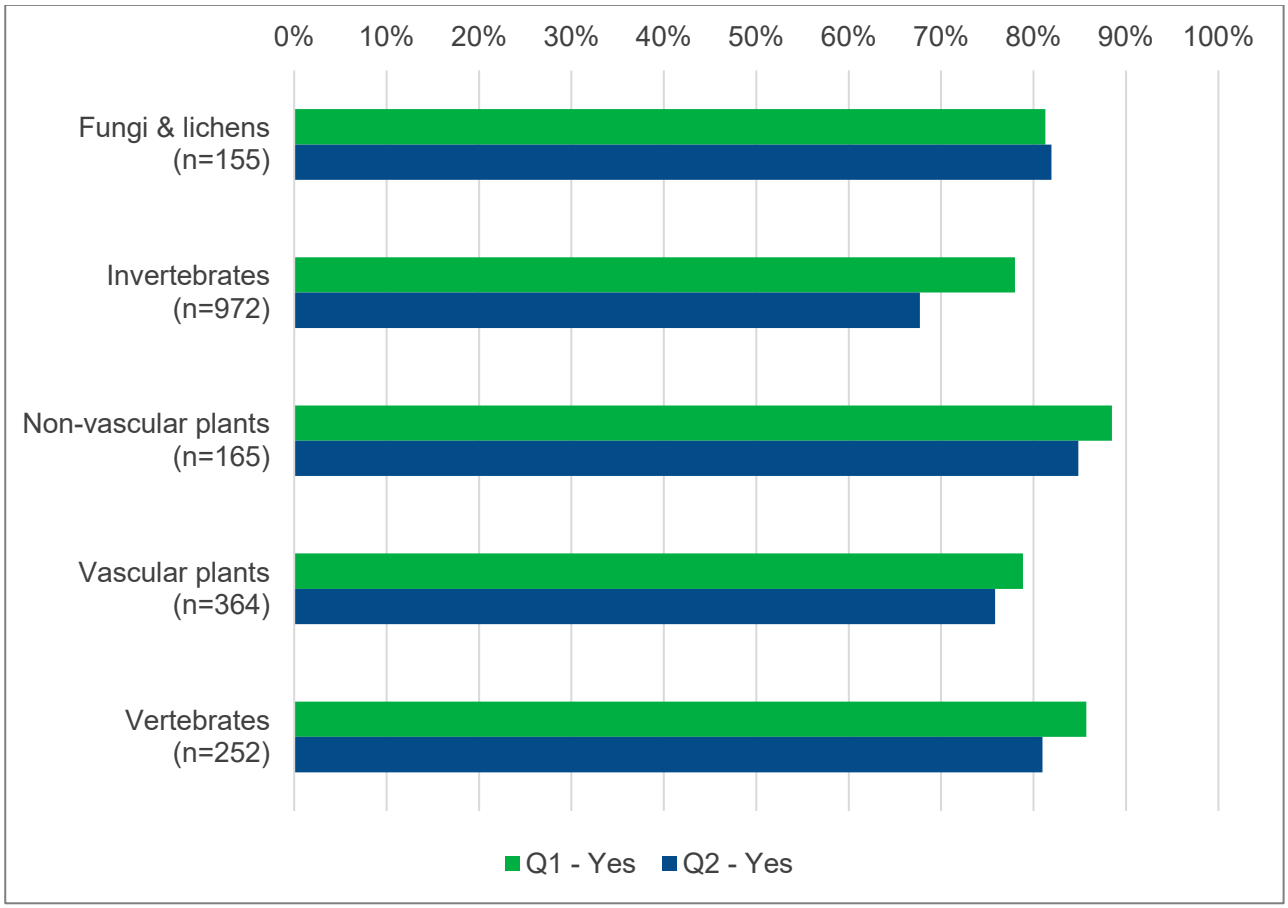


Figure 7. Positive responses to the action-planning criteria for each taxon group. A 'Yes' response to Q1 indicated that the species was a priority for action due to its England status; a 'Yes' response for Q2 meant that its recovery/conservation depended on species-specific action. Only species with a 'Yes' for both Q1 and Q2, qualified for action drafting in TSRA.



Responses to the criteria questions varied moderately across taxonomic groups (Figure 7). Groups with 80% or more of species meeting both criteria (positive responses to Q1 and Q2), were fungi and lichens, non-vascular plants and vertebrates, whereas for vascular plants and invertebrates, the proportions were 74% and 67%, respectively. However, beneath these high-level groups (Taxonomic group-1), there was considerable variance. At 'Taxonomic group-3' level, groups of 10 or more species but less than 50% qualifying were: dragonflies/damselflies, long-legged flies, moths, shield bugs (and allies), and trees. In contrast, groups (of 10 or more) at 90% or above species qualification were: bees, caddisflies, fishes, grasses, liverworts and soldier beetles (and allies).

Q3 asked whether the species would benefit from untargeted habitat management (section 5.4). Of 1,376 species with a response to this question (a subset of those that qualified for actions), 39% would benefit. Note that this was defined as additional benefit to that arising from the actions.

7.2 Key actions

The datasheet contains a total of 3,625 actions, on which the following analysis is based.

The Species Recovery Curve step (Figure 1, Appendix 2) each action contributes to, is summarised in Figure 8, and the associated action type shown in Figure 9. Actions addressing evidence gaps were most frequent, with just over a quarter concerning scientific research, which mirrors the high proportion associated with SRC steps 4, 5 and 6 (57% collectively). Allied to this, action types concerning surveys, status reviews, and targeted monitoring, together amounted to a further 29% of actions, relating to SRC steps 2 and 3 in particular (25% combined). On-the-ground recovery work, including actions for habitat management and creation (at all scales), local mitigation, reintroduction, climate change adaptation and special *in situ* measures collectively comprised 26% of actions, mainly relating to SRC steps 7 and 8 (16% combined). Whilst the latter may seem a relatively low percentage, it may reflect a tendency for TSRA species to be at lower steps on their recovery curves.

Figure 8. The SRC step each action addressed. This shows the number of actions assigned by contributors to each SRC step (n=3,625).

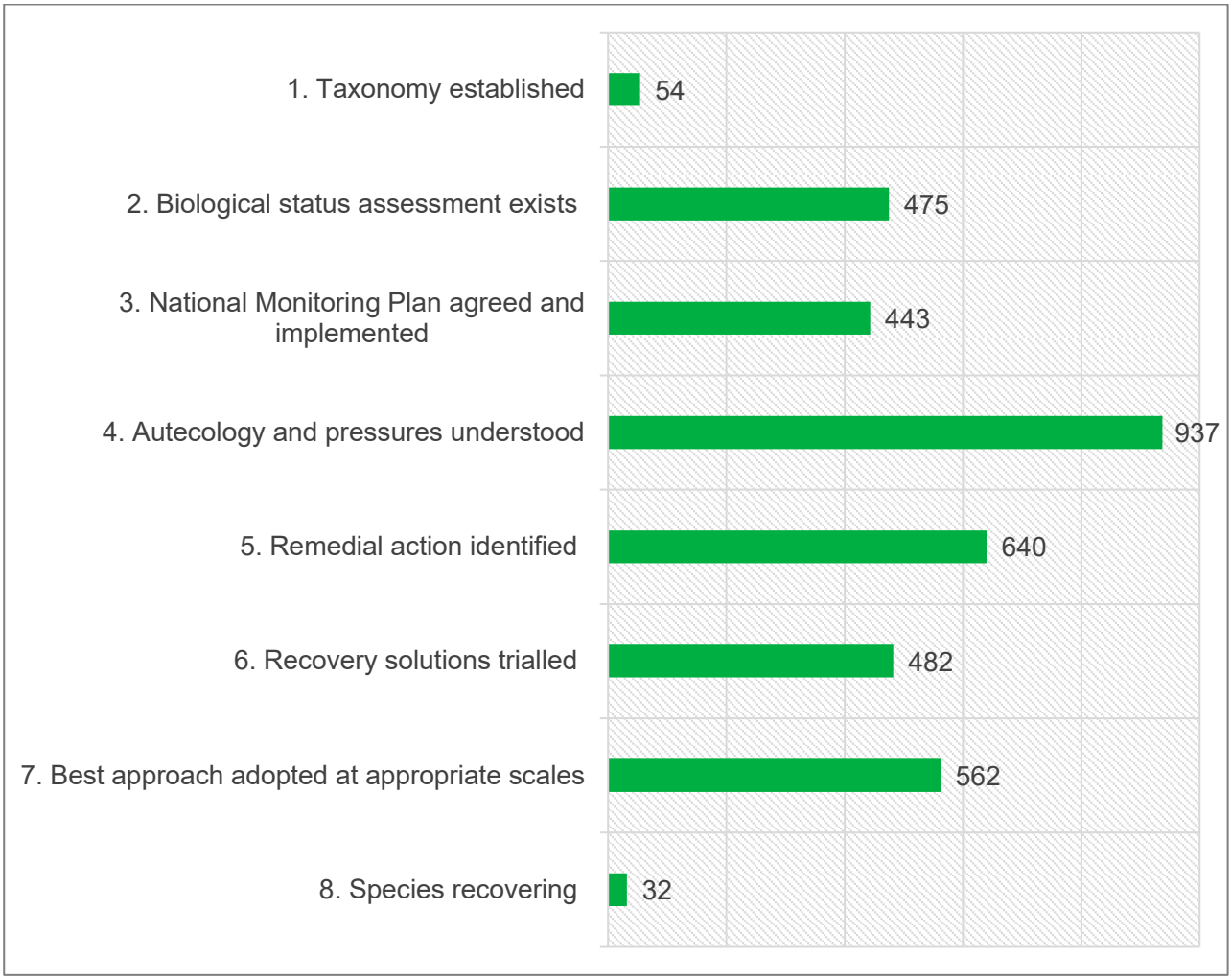
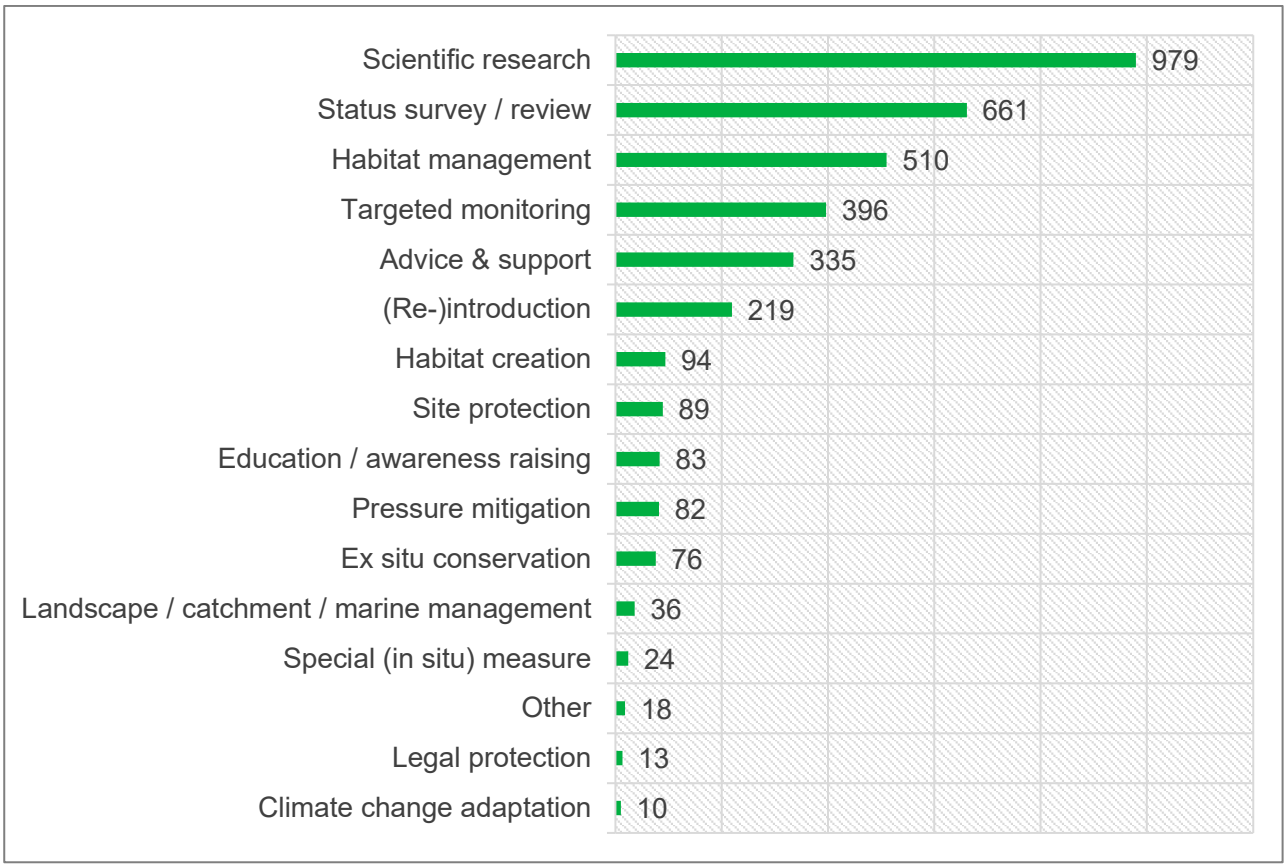
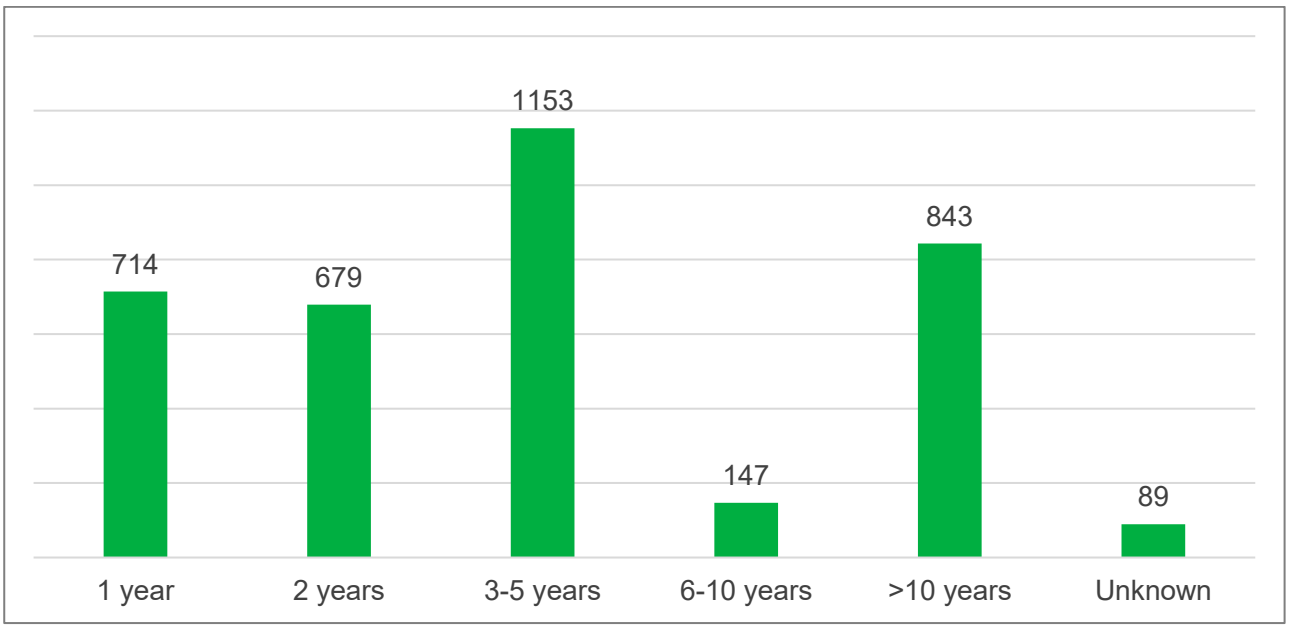


Figure 9. The action type of each key action. This shows the number of actions allocated to each action type (n=3,625).



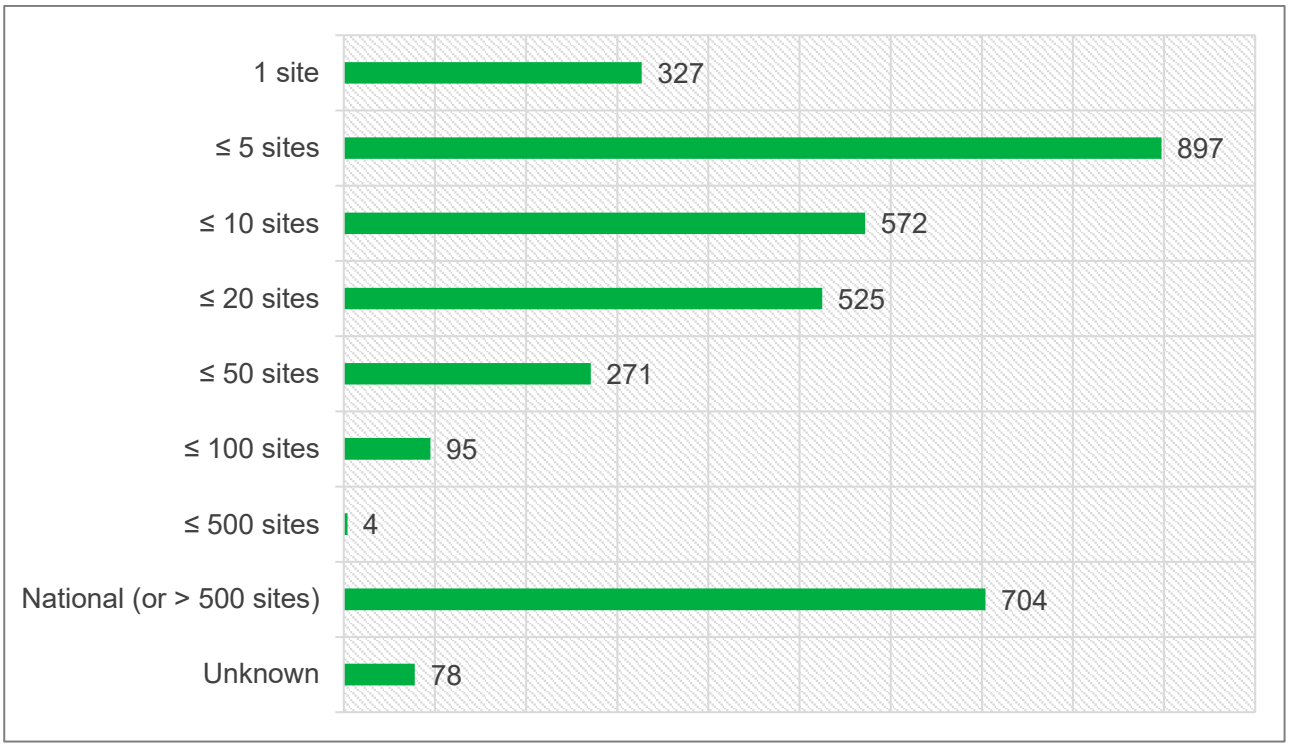
The low number of actions allocated to 'climate change adaption' may be an artefact of the typology and users' difficulty in applying it (section 5.7). For example, habitat connectivity and networks were included in the habitat creation definition, whilst different elements of conservation translocation were covered under three action types.

Figure 10. Key action duration. This shows the number of actions assigned to each duration class (n=3,625). Duration was defined as the entire lifespan of the action.



Most actions (70%) were expected to have a lifespan of 5 years or less, with a peak in the 3-to-5-year category (Figure 10). Second most frequent were actions that needed to endure for more than 10 years (23%).

Figure 11. The scale of action implementation. This shows the number of actions assigned to each implementation scale (n=3,473), excluding a 'not applicable' class for actions where spatial scale was not relevant. Classes were simplified as below but were mutually exclusive – e.g. ≤ 20 sites meant from 11 to 20 sites, inclusive.



Actions which required delivery at 2 to 5 sites (inclusive) were most frequent, equating to about 26% of all actions with relevant data (Figure 11). National scale actions amounted to a further 20%. Generally, most actions (67%) fell in the 20 sites or fewer categories.

8. TSRA in future

8.1 Multi-species projects

Despite the large number of species involved, TSRA has taken an individual species action-planning approach. This granularity allows maximum flexibility for actions to be grouped and organised for project planning and development. However, in some taxonomic groups this has resulted in a tendency for action repetition, with contributors proposing that actions should be grouped, or an assemblage-based approach taken – e.g. for relic-fen water beetles. Details can be found under comments, or in the action text, where relevant.

Identifying themes to develop into multi-taxa projects, both within and across taxonomic groups, has been successfully demonstrated many times. For example, the Back from the Brink initiative (2017-21) Programme overview - Back from the Brink included seven integrated (multi-taxa) projects which focussed on the recovery of many S41 and threatened species. In this regard, TSRA has great potential for developing multi-taxa projects and programmes into the future (section 8.2).

8.2 SEB platform

As described in section 4, Natural England's Species Evidence Base is the intended future platform for TSRA, allowing the two datasets to be interrelated. For example, it will be possible to see which species occur in which English regions and therefore which actions are relevant in a more local context (section 5.6.3); or to pull up a list of TSRA species that are associated with a particular wildlife-rich habitat (Hall *et al.*, 2024); or to identify groups of species impacted by the same environmental pressure. All of the above represent powerful new tools for project development, providing the means to group species and their actions for more efficient and cost-effective delivery.

8.3 Update cycle and Reporting

Cyclical updates will keep TSRA relevant and adaptive, responding to the effectiveness of action delivery, whilst also considering new and emerging evidence. As set out in section 4, actions only capture current priorities and, in isolation, will seldom result in sustained recovery. The iterative approach taken by TSRA, aims to progress species along their recovery curves. Therefore, the success of TSRA, in terms of the project's contribution to the extinction risk target, will depend upon regular updates.

Updates will be held at specific times, during which:

- Criteria responses can be reviewed after a change in Red List status, or in light of new evidence.
- Newly eligible species (and those outstanding in the base list) can be evaluated.
- New actions can be added to replace those completed.
- Existing actions can be revised.

A further objective will be to update scientific names using the latest version of UKSI and adjust for any taxonomic changes.

Updates will also involve action reporting, for the purposes of monitoring and evaluation. Although a reporting tool is not yet available, reporting will be possible via action admin fields in the dataset. As well as action-based reporting, it will also be possible to relate progress to the Natural England Species Recovery Curve (Figure 1).

References

References of partnered action plans are given in Appendix 1. Datasheet sources are listed under the References tab in the spreadsheet.

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Appendix 1. Examples of single-species action plans

The following ongoing action plans and conservation strategies have been partnered by Natural England.

Black-tailed Godwit (2023-33)

Lee, R. 2023. National Single Species Action Plan for the UK Breeding Population of Black-tailed Godwit *Limosa limosa limosa* 2023-2033. RSPB, WWT & Natural England.
National Single Species Action Plan for the UK Breeding Population of Black-tailed Godwit

Pine Marten (2021-2031)

MacPherson, J., & Wright, P. (2021). Long-term strategic recovery plan for pine martens in Britain. Vincent Wildlife Trust, 72.
Long-term strategic recovery plan for pine martens in Britain

Hedgehog (2024-34)

IUCN/CPSG (2024). Britain's National Hedgehog Conservation Strategy. IUCN SSC Conservation Planning Specialist Group, MN, USA.
Britain's National Hedgehog Conservation Strategy

Red Squirrel (2023-28)

UK Squirrel Accord, 2023. England Red Squirrel Action Plan 2023-2028, London.
England Red Squirrel Action Plan 2023-2028

Sturgeon (2023-33)

McCormick, H., Murray, J., Colclough, S., Gessner, J., Greenslade, J., Reynolds, L., Hedges, S., Philipsen, P., Debney, A. (Eds), 2023. UK Sturgeon Conservation Strategy and Action Plan. Zoological Society of London, UK. 39 pp.
UK Sturgeon Conservation Strategy and Action Plan

Shrill Carder Bee (2020-30)

Page, S., Lynch S., Wilkins, V. and Cartwright, B (2020) A Conservation Strategy for the Shrill carder bee *Bombus sylvarum* in England and Wales, 2020‑2030. Bumblebee Conservation Trust, Stirling, Scotland UK.
A conservation strategy for the Shrill carder bee in England and Wales

Appendix 2. Species Recovery Curve step definitions

The table below provides descriptions of the main aim of each step of the Natural England Species Recovery Curve shown in Figure 1.

Species Recovery Curve step	Main aim of step
1. Taxonomy understood	To establish 'taxonomic status' – often genetic work to determine whether something is a species or subspecies or race etc.
2. Biological status assessment exists	To complete an IUCN assessment of extinction risk (aka 'Red List' assessment) usually at GB scale.
3. National Monitoring Plan agreed and implemented	To agree and implement monitoring that is sufficient to identify changes in range and population.
4. Autecology and pressures understood	To establish what conditions the species needs to persist and what is stopping it from receiving these.
5. Remedial action identified	To identify actions that may reduce or eliminate pressures and/or allow the species to overcome them.
6. Recovery solutions trialled	To establish which interventions will stop decline and support recovery.
7. Best approach adopted at appropriate scales	To integrate tried and tested solutions into existing delivery mechanisms or create new ones.
8. Species recovering	The species is benefitting from solutions being put in place and is beginning to recover.
9. Species recovered – target reached	The species has recovered.

Appendix 3. Spreadsheet menu options

Data entry in the Datasheet was made more rapid and reliable through use of the dropdown menus listed below. Full definitions of these can be found in the 'Datasheet key' tab. Note that the 'Scale of implementation' classes were abbreviated in dropdowns but were mutually exclusive – e.g. '≤ 10 sites' meant in the range of 6 to 10 sites.

Current SRC step; SRC step action addresses
1. Taxonomy established
2. Biological status assessment exists
3. National Monitoring Plan agreed and implemented
4. Autecology and pressures understood
5. Remedial action identified
6. Recovery solutions trialled
7. Best approach adopted at appropriate scales
8. Species recovering
9. Species recovered (target reached)

Recovery potential / expectation
Medium-high
Low - Climate change
Low - Extinction debt
Low - Life history factor/s
Low - Pathogen, hybridisation, INNS
Low - Policy conflict (detail in comments)
Low - Pressures acting outside England
Low - Relict or natural rarity
Low - Combination or other (detail in comments)
Unknown

National monitoring resource
Structured - sufficient
Structured - insufficient
Opportunistic - sufficient
Opportunistic - insufficient
Combination - sufficient
Combination - insufficient

Action type
Advice & support
Climate change adaptation
Education/awareness raising
Ex situ conservation
Habitat creation
Habitat management
Landscape/catchment/marine management
Legal protection
Pressure mitigation
Reintroduction
Scientific research
Site protection
Special (in situ) measure
Status survey/review
Targeted monitoring
Other (specify in comments)

Duration (of action)
1 year
2 years
3-5 years
6-10 years
>10 years
Unknown

Scale of implementation (of action)
1 site
≤ 5 sites
≤ 10 sites
≤ 20 sites
≤ 50 sites
≤ 100 sites
≤ 500 sites
> 500 sites
National
Not applicable
Unknown

Appendix 4. Taxonomic composition of Tranches 1 and 2

Action planning was split into two tranches which took place over two financial years. The contents of each tranche are summarised below.

Tranche 1

Taxonomic group	Species count
Amphibian	4
Bird	148
Bony fish (Actinopterygii)	21
Cartilaginous fish (Chondrichthyes)	13
Clubmoss	1
Conifer	2
Crustacean	3
Fern	3
Flowering plant	134
Fungus	81
Insect - beetle (Coleoptera)	77
Insect - butterfly	34
Insect - caddis fly (Trichoptera)	22
Insect - dragonfly (Odonata)	13
Insect - hymenopteran	6
Insect - mayfly (Ephemeroptera)	8
Insect - moth	142
Insect - orthopteran	6
Insect - stonefly (Plecoptera)	3
Insect - true bug (Hemiptera)	25
Insect - true fly (Diptera)	17
Lichen	28
Marine mammal	17
Mollusc	31
Quillwort	1
Reptile	8
Spider (Araneae)	129
Stonewort	9
Terrestrial mammal	25
Grand Total	**1011**

Tranche 2

Taxonomic group	Species count
Alga	5
Annelid	1
Bony fish (Actinopterygii)	13
Bryozoan	2
Centipede	5
Chromist	1
Clubmoss	1
Coelenterate (=cnidarian)	11
Crustacean	5
Fern	8
Flowering plant	214
Fungus	14
Insect - beetle (Coleoptera)	311
Insect - earwig (Dermaptera)	1
Insect - hymenopteran	25
Insect - true bug (Hemiptera)	1
Insect - true fly (Diptera)	83
Jawless fish (Agnatha)	2
Lichen	32
Liverwort	40
Millipede	6
Mollusc	4
Moss	110
Ribbon worm (Nemertea)	1
Terrestrial mammal	1
Grand Total	**897***

***Of the TSRA base list, 205 lichens remained unassessed.

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