Wilder Blean Species Prioritisation Workshop Report

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We are the Conservation Decisions Hub at the Zoological Society of London. We use decision support tools to systematically and transparently tackle complex conservation problems. This involves clarifying decision problems, defining clear objectives that incorporate varied perspectives and values, identifying management options, and evaluating and comparing the potential outcomes of these options in the face of uncertainty. Our goal is to enhance the effectiveness of conservation decision-making to aid in the successful conservation of wildlife populations and habitats.

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Executive Summary

The Wilder Blean Species Prioritisation Workshop Report, facilitated by the Zoological Society of London for Kent Wildlife Trust, documents a collaborative effort to restore the Blean landscape through species recovery.

The Blean, a significant area of ancient woodland in southern England, has faced fragmentation due to farming and development, limiting wildlife movement and public access. The workshop aimed to systematically prioritise species for conservation actions over the next ten years, employing Structured Decision Making (SDM) to take into consideration varied objectives such as ecosystem functionality, public support, cost, and impact on native species.

The four-day workshop was attended by 17 participants from different sectors representing diverse perspectives and values. The process began with clarifying the decision problem, followed by defining five clear objectives. A shortlist of 22 key species was produced from an initial list of approximately 1400 candidate species through group brainstorming and assessing how well each species performed against each objective. This shortlist was then used to develop alternative species sets and predict the consequences of each species set against the objectives. Participants then evaluated trade-offs to determine the overall utility of each species set whilst accounting for differences in how important each objective was to each participant. Overall, seven species sets were assessed, and no final decision was made on which species set to prioritise. However, three of the seven species sets performed consistently higher than the others. These were the Full Set (all 22 shortlisted species), Set 1 that focused on woodland and aquatic species, and Set 4 that focused on species that provide diverse ecosystem functions:

Set 1

Brown trout (*Salmo trutta*)
Eurasian beaver (*Castor fiber*)
Eurasian golden oriole (*Oriolus oriolus*)
Eurasian otter (*Lutra lutra*)
European turtle dove (*Streptopelia turtur*)
Horned dung beetle (*Copris lunaris*)
Red deer (*Cervus elaphus*)
Wild service tree (*Sorbus torminalis*)

Set 4

Common nightingale (*Luscinia megarhynchos*)
Eurasian beaver (*Castor fiber*)
Eurasian otter (*Lutra lutra*)
Heath fritillary (*Melitaea athalia*)
Horned dung beetle (*Copris lunaris*)
Lesser spotted woodpecker (*Dendrocopus minor*)
Narrow-headed ant (*Formica exsecta*)
Shrill carder bee (*Bombus sylvarum*)
Wild service tree (*Sorbus torminalis*)

The SDM approach provided a transparent framework for decision-making, accommodating uncertainties and diverse values. The workshop highlighted the importance of incorporating more expertise on plants and invertebrates and ensuring an even broader representation of stakeholder values in future iterations. The iterative nature of SDM easily allows for these updates to the species lists and scoring, ensuring flexibility in future conservation efforts. The workshop concluded with optimism about the process' potential to improve decision-making for species recovery in the Blean and achieve the best outcomes for the Blean landscape.

Contents

1. Background to the Workshop

The Blean is the largest area of ancient woodland in southern England. Several invertebrate species thought to be extinct in the UK have recently been recorded in the Blean and it is a hotspot for the rare and iconic heath fritillary butterfly and Red-list woodland specialist birds. However, the Blean landscape has been fragmented by farming and development resulting in isolated pockets of woodland, limiting the movement of wildlife and grazing animals, and restricting public access.

The Wilder Blean Initiative, a partnership between Kent Wildlife Trust, Woodland Trust and Royal Society for the Protection of Birds (RSPB), has embarked on a collaborative journey to secure the future of the Blean. Over the next ten years, the Wilder Blean Initiative will bring together the knowledge and ideas of the community, landowners/managers, and other stakeholders to build and begin implementing a vision for the recovery of the Blean landscape.

The Wilder Blean Species Prioritisation Workshop, facilitated by the Zoological Society of London, was an exciting step towards this vision. The four-day workshop employed a Structured Decision Making approach with the purpose of assessing a range of species and sets of species for possible recovery, reintroduction or conservation introduction in the Blean.

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2. Structured Decision Making

Making decisions around environmental management is often a complex task involving engagement of varied stakeholder groups and evaluation of many potential actions that could be implemented. Managers are often required to make decisions with limited information and little opportunity to gather more data before acting. Decision support tools can help managers to make the best decisions with the information available.

Structured Decision Making (SDM) is a collaborative and facilitated approach used for problem solving. It is increasingly used in fields such as environmental management and public policy and is recommended by DEFRA's English Code on reintroductions. The process is based on an iterative cycle (**Figure 1**) commonly referred to as the PrOACT cycle in which the decision **Pr**oblem is clearly defined, **O**bjectives are explicitly stated, **A**lternative management strategies are defined and evaluated in terms of their predicted **C**onsequences on each objective, and **T**rade-offs are evaluated to inform a decision, while explicitly accounting for uncertainty. The implementation and monitoring of the decision provides insights that can be used to update the underlying information and assumptions during further iterations of the process. The SDM process also recognises that decisions are values-focused and, therefore, it explicitly integrates both science and values. Whilst SDM does not guarantee favourable outcomes, it increases the likelihood of achieving the best outcome.

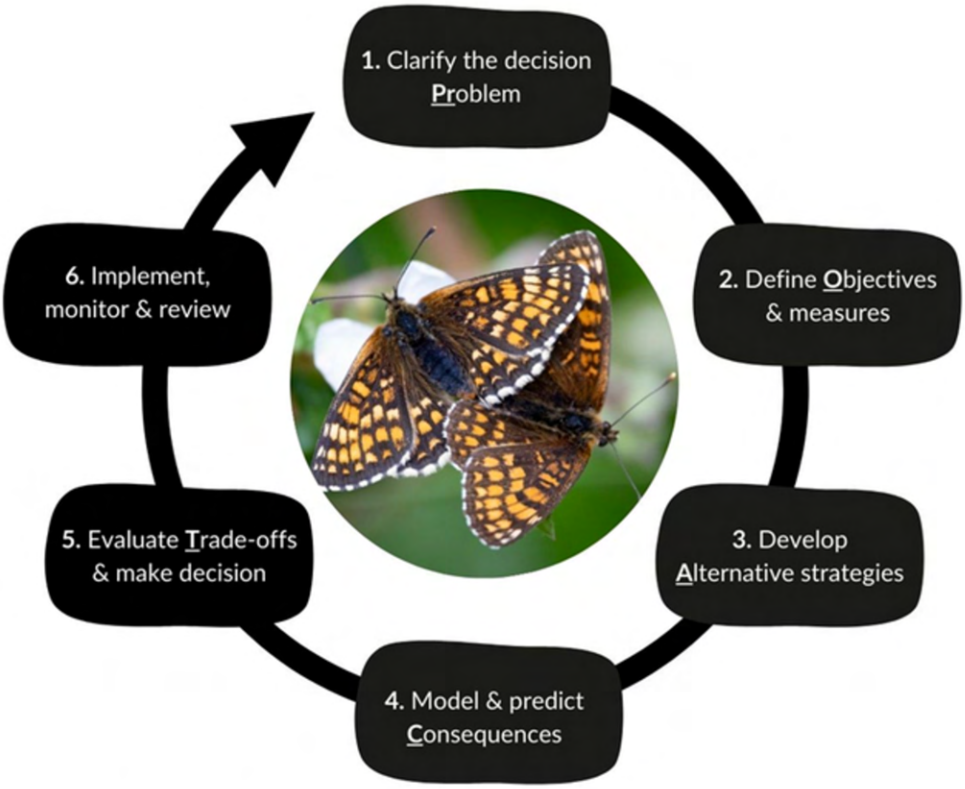


Figure 1. *The Structured Decision Making cycle, or PrOACT cycle, showing how the decision space can be navigated by clarifying the decision problem, defining objectives, developing alternatives, predicting consequences, and evaluating trade-offs before coming to a decision.*

PrOACT cycle summary:

1. *Clarify the decision problem*. This is achieved by creating a 'problem statement' that highlights the focus and scope of the decision problem and why it has arisen.

2. *Define objectives and measures*. The SDM process is values-based, integrating the preferences and values of the decision-makers and stakeholders to identify the optimal management strategy. This process recognises that a strategy is simply a way of achieving a suite of given objectives, thus no 'best' strategy can be defined unless the objectives are clearly stated alongside clear ways to measure each objective.

3. *Develop alternative strategies*. Once the objectives are clearly established, it is possible to define the potential management actions that could best achieve the objectives. Candidate strategies that include different combinations of actions are then constructed (i.e. alternative strategies). Given the biological and non-biological complexity of most environmental management, several alternative strategies with differing combinations of actions will likely be available and worth evaluating.

4. *Model & predict consequences*. Alternative strategies are then compared in terms of their expected outcomes with regards to the objectives. Outcomes, or consequences, can be predicted in different ways including using models of the biological system and eliciting expert knowledge.

5. *Evaluate trade-offs & make decision*. Objectives can often conflict with each other. It is necessary to understand how much each objective is valued relative to the others to make a decision that explicitly addresses the trade-offs at hand. In addition, it can be difficult to decide which strategy to choose when the outcomes of each strategy are uncertain. Acknowledging and quantifying uncertainty, and evaluating its influence on the expected outcomes of alternative strategies, improves transparency and provides decision-makers with a more complete assessment of the problem to aid in the decision making. SDM can draw from a wide array of tools to account for uncertainty and help trade-off competing objectives.

6. *Implement, monitor & review*. Once a strategy is chosen and implemented, it is important to monitor the outcomes to improve the information base for future decisions. A review mechanism should also be included in implementation so that new information can be incorporated into future decisions.

For more information about SDM, we suggest the following reading:

Gregory, R., Failing, L., Harstone, M., Long, G., McDaniels, T., & Ohlson, D. (2012). Structured decision making: a practical guide to environmental management choices. John Wiley & Sons.

Ewen, J., Canessa, S., Converse, S., & Parker, K. (2022). Decision-Making in Animal Conservation Translocations: Biological Considerations and Beyond. In R. Mubarak (Author) & M. Gaywood, J. Ewen, P. Hollingsworth, & A. Moehrenschlager (Eds.), Conservation Translocations (Ecology, Biodiversity and Conservation, pp. 108-148). Cambridge: Cambridge University Press.

Fischer, J., Parker, K., Kenup, C., Taylor, G., Debski, I. & Ewen, J. (2022). A structured decision-making approach for the recovery of kuaka / Whenua Hou diving petrel (*Pelecanoides whenuahouensis*). Department of Conservation.

3. Workshop Participants

The workshop was attended by 17 people representing a variety of parties, organisations, and values. Daily attendance varied based on each participant's availability, as noted in **Table 1**.

Table 1. *Workshop participants, their affiliations, and the days of the workshop they were present for.*

Name	Organisation	Day 1	Day 2	Day 3	Day 4
Adriana Consorte-McCrea	Canterbury Christ Church University	✓	✓	✓	✓
Andy Clements	England Species Reintroduction Taskforce (ESRT)			✓	✓
Ben Morris	Environment Agency	✓	✓	✓	✓
Caitlin Brant	Kent Wildlife Trust	✓			✓
Delphine Pouget	Natural England & ESRT	✓	✓	✓	✓
Georgia Merrell	Ecosulis	✓	✓	✓	✓
Helen Pitman	Kent Wildlife Trust	✓	✓	✓	✓
Keeley Atkinson	Kent Wildlife Trust	✓	✓	✓	✓
Kirsty Swinnerton	Kent Wildlife Trust	✓	✓	✓	✓
Matt Hayes	Kent Wildlife Trust	✓	✓	✓	✓
Mel Dawkins	Canterbury County Council	✓	✓		✓
Paddy Hipple-Walsh	Ecosulis	✓	✓	✓	✓
Patrick Kitchener	Woodland Trust	✓			✓
Rachel Gardner	Forestry England & ESRT	✓	✓		
Richard Griffiths	Kent Reptile and Amphibian Group	✓	✓		
Ross Johnson	Kent Wildlife Trust	✓			
Sian Pettman	Canterbury District Biodiversity Network	✓	✓		

4. Workshop Overview

This four-day workshop cycled through the main SDM steps to support Kent Wildlife Trust in reaching a decision over which set of species to prioritise for recovery in the Blean. The process recognises that the chosen combination of species is a set that best achieves the various objectives (values) of the stakeholder group involved in the Wilder Blean Initiative where trade-offs are directly assessed. An overview of the key steps of the process are given below.

Prior to the workshop, a questionnaire was circulated to participants to better understand their values and aspirations for the Wilder Blean landscape. The workshop facilitators used the questionnaire answers to develop a draft problem statement. The problem statement was refined with the group on Day 1 of the workshop. A 'rapid prototype' was also completed on Day 1 whereby the group worked through steps 2-4 of the PrOACT cycle to sketch the objectives, possible actions (species sets), and consequences at a coarse level (**Figure 2A**). Given the nature of the decision problem, the possible alternatives were different combinations of species.

The other three days of the workshop were dedicated to working through steps 2-5 of the PrOACT cycle more thoroughly to refine the objectives and species sets (**Figure 2B**). Before developing the species sets, a longlist of approximately 1400 candidate species was narrowed to a more manageable set (**Figure 3**). Once the species list was shortened, the consequences of the species and sets of species were predicted for each objective, then a trade-off exercise was conducted where individuals assigned weights to the objectives based on how important each one was to them (**Figure 2B**). For each participant, facilitators used the elicited weights to calculate an overall utility score for each species set to assess which performed best against the objectives.

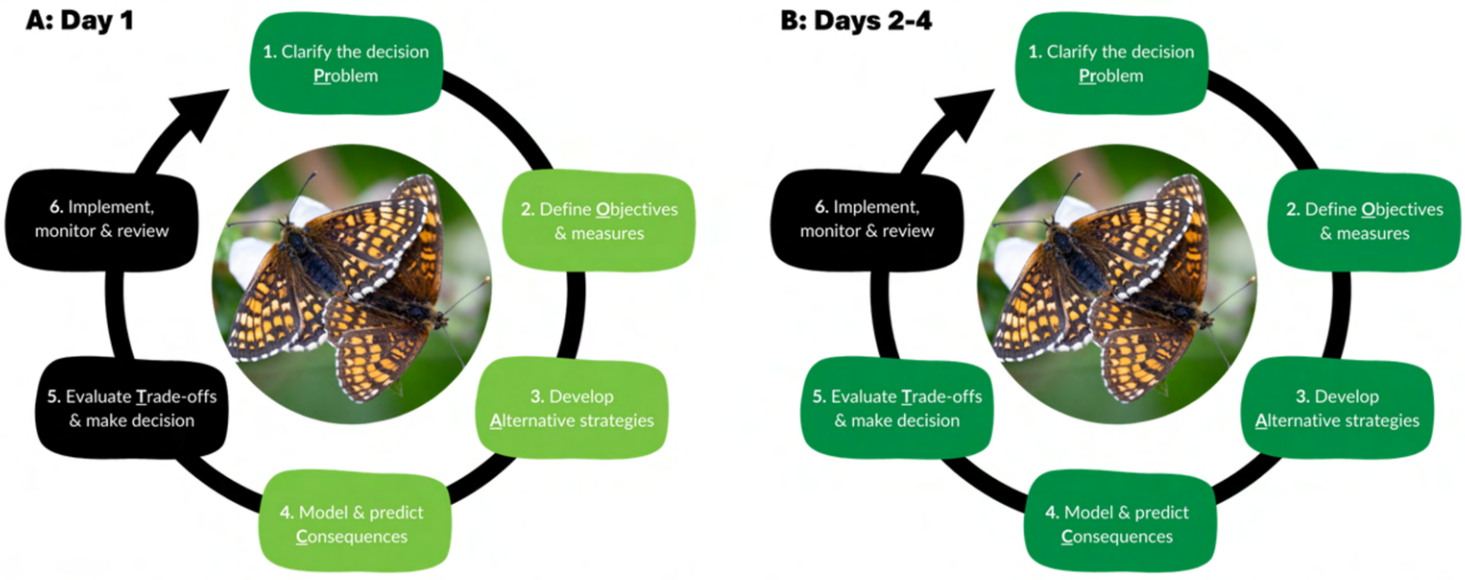


Figure 2. *Overview of the steps conducted at different stages of the workshop. Day 1 was focused on clarifying the decision problem by refining a problem statement followed by sketching the objectives, alternatives (species sets), and consequences. Days 2-4 then refined the work conducted on Day 1 to develop a set of agreed upon objectives and alternatives (species sets), predict the consequences of each species set against the objectives, and then conduct a trade-off exercise to determine the overall utility of each species set for the objectives.*

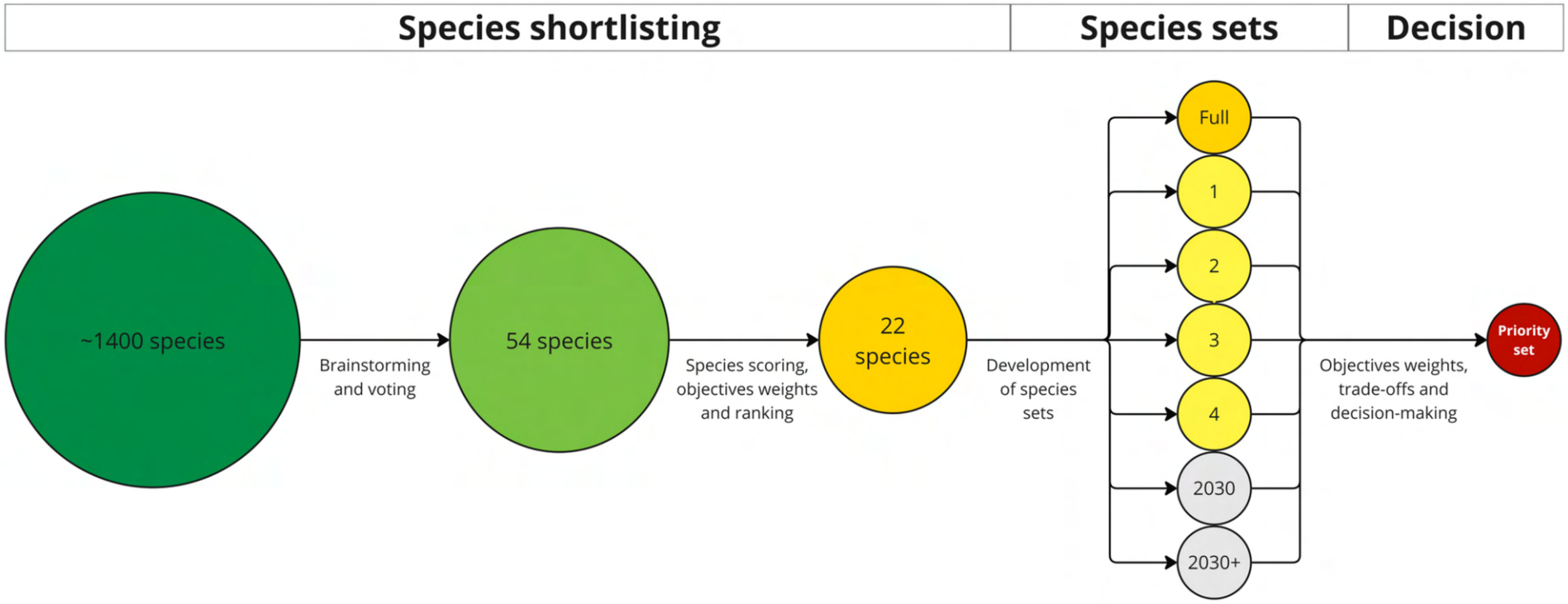


Figure 3. *Overview of the process for deciding a set of species to prioritise for recovery in the Blean. First, a longlist of approximately 1400 species was drafted based on current or historical records (from Kent & Medway Biological Records Centre (KMBRC)) from the Wilder Blean area (see **Figure 4**) and species deemed to be missing from Kent that the Wilder Blean could support (i.e. potential candidates for reintroduction or conservation introduction). To understand commonalities with the Local Nature Recovery Strategy (LNRS), the list was also cross-referenced with a preliminary longlist of LNRS priority species although this did not influence the selection process. This longlist was narrowed down to 54 species through a process of brainstorming and voting by workshop participants. Then, all 54 species were scored against the fundamental objectives. A trade-off exercise was then conducted whereby participants weighted each objective by how important it was to them, and the facilitators then calculated a utility score for each species for each participant. Thus, each participant had a ranked list of species, with 22 species making the final shortlist based on the frequency by which they occurred in participants' top 20 species. Participants were then split into two groups and asked to develop two alternatives, or species sets, per group from this list of 22 species (Sets 1-4 above). Three more sets were introduced – a full set containing all 22 species ('Full' set above) and two sets containing the current species listed in Kent Wildlife Trust's 2030 Visions ('2030' and '2030+' above). Objective weights and trade-off analyses were then conducted to help with the decision over which set to choose as the priority species set.*

5. Pre-Workshop Questionnaire Summary

Before the workshop, participants were asked to complete an anonymous, online questionnaire.

The questions were as follows:

- *What is your vision for the recovery of the Blean?*
- *What do you hope to achieve with species recovery / reintroduction in the Blean?*
- *What concerns would you address when prioritising species for recovery / reintroduction in the Blean?*
- *What do you think would be the best outcome from species recovery / reintroduction in the Blean?*
- *Conversely, what is the worst that you think could happen?*
- *What actions or outcomes do you want to avoid with species recovery / reintroductions in the Blean?*
- *What barriers could prevent the successful recovery / reintroduction of species in the Blean?*

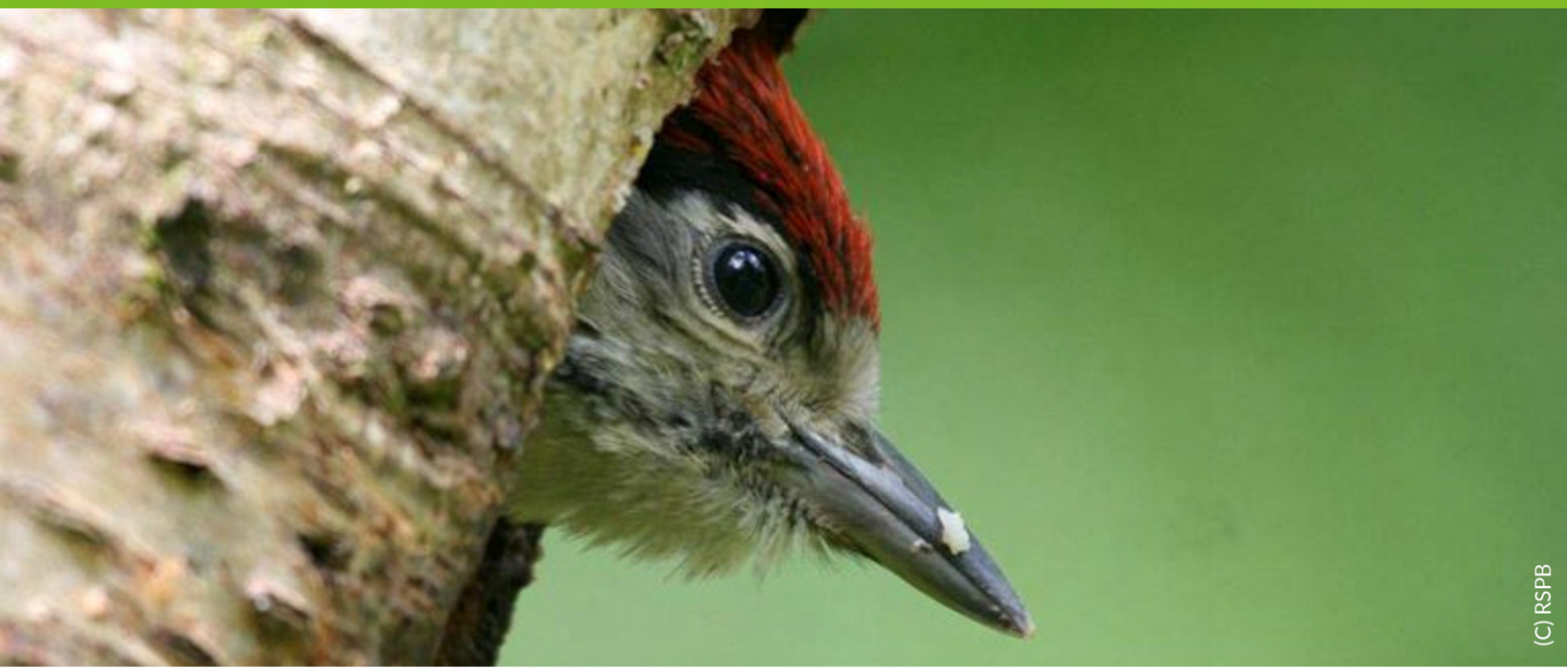
Responses were collected anonymously from 15 people and summarised by the workshop facilitators into 13 themes of what people cared about. These themes were further grouped by the workshop facilitators into three categories:

Ecosystem Health
- Invasion risk
- Ecosystem resilience
- Impact on resident species
- Habitat connectivity
- Habitat diversity

Public Support
- Public awareness
- Public use
- Stakeholder involvement
- Human-wildlife conflict

Pragmatics
- Management reliance
- Cost
- Regulatory protections
- Scientific soundness

6. Stage 1: Problem Statement



A draft problem statement created by the workshop facilitators (based on the questionnaire responses) was presented to the group on Day 1 of the workshop for discussion and modification. The main elements of the discussion included the types of management to be considered, timelines, spatial extent, and public concerns.

For the types of management to be considered, people discussed whether the workshop should focus on more than just species and include other recovery actions such as habitat management. Another element to this discussion was whether the species under consideration in the workshop should be limited to those needing translocations, or whether to include all species. After discussion, the group decided to restrict actions to species and to consider all species, not just those requiring translocations. As such, the group decided that the decision problem should centre around choosing appropriate sets of species for the projected habitat in the Blean rather than incorporating habitat modifications into the alternatives.

The group settled on a timeline of 10 years for implementation on the basis that this provides a realistic management timeframe but agreed that longer-term outcomes could be predicted beyond the 10 years. Given the iterative nature of SDM, the species sets can also be updated through time. The spatial extent under consideration was not initially clear to the group but was clarified as that defined by the boundary in **Figure 4**.

Participants also discussed how public concerns would feed into the process and to ensure this was captured in the problem statement. The facilitators explained that the process of SDM ensures different peoples' values are captured and this was made explicit in the finalised problem statement. Similarly, participants asked how this process was different from the LNRS, which has a priority species list, and it was explained that the difference is in the inclusion of varied biological, economical, and social values beyond rarity and local importance of the species.

Problem Statement

The Wilder Blean Initiative will decide how to invest limited resources (money, land, time, etc.) in the Blean landscape (as defined by the boundary of the map in **Figure 4**) with regards to conservation translocation and other species recovery actions over the next 10 years under current and expected landscape change. The set of prioritised species will be influenced by a range of values representing the people who influence, or are influenced by, the Blean landscape, uncertainties around predicted outcomes, potential constraints including a changing climate, and national species priorities. Whilst it is important that all stakeholders' values are represented in this decision, the ultimate choice will be one approved by various regulatory bodies as determined by the species. After this 4-day workshop, a report will be written summarising the efforts during the week and provided to the Wilder Blean Initiative for further iteration (as needed), sharing, and implementation.

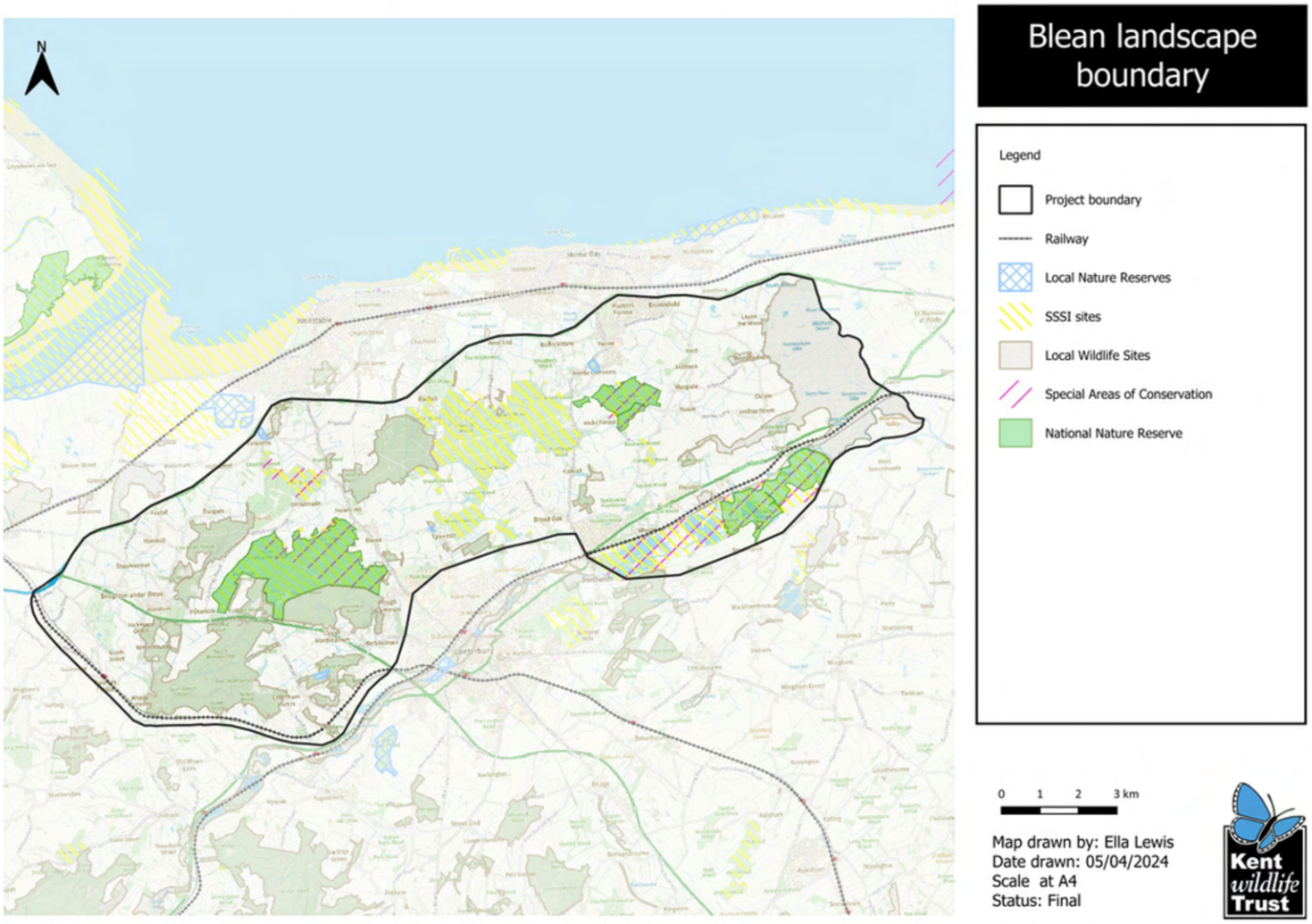


Figure 4. *Map of the Wilder Blean area provided by Kent Wildlife Trust.*

7. Stages 2-4: Rapid Prototype

Objectives

Background

In SDM, objectives are a statement of values where the considerations that matter most to people are articulated as concise, context-specific statements. There are three main types of objectives: fundamental, means, and process objectives. Fundamental objectives are the overarching goals that people care about the most, whereas means objectives are 'intermediate' objectives that are important because they help in achieving the fundamental objectives. Process objectives are those that describe how people want a decision to be made.

Exercises

During the workshop, participants were shown the themes summarised by the facilitators from the questionnaire responses. They were then given 10 minutes to individually brainstorm objectives by writing down what they hoped to achieve or avoid. The facilitators then went around the room asking each participant in turn to share one objective they had brainstormed until an exhaustive list was obtained. The facilitators then condensed these objectives into a set of draft fundamental objectives for discussion and refinement by the whole group.

Outcomes & Discussion

The full list of objectives from the brainstorming session can be found in **Table A1** of the Appendix. The agreed upon set of preliminary fundamental objectives were:

- Maximise ecosystem functionality in the Blean
- Maximise biodiversity in the Blean
- Maximise happiness of people
- Minimise management effort
- Minimise negative impacts to native resident species
- Minimise cost

Alternatives

Background

From an SDM perspective, 'alternatives' are the possible actions that could be implemented to achieve the fundamental objectives. Alternatives are usually a suite of multiple actions rather than a single action. In this case, alternatives are sets of species to be considered together as priority species for recovery and reintroduction in the Blean.

Exercises

Four different categories of species were listed on separate flip charts and participants were asked to move around the room and brainstorm species under each category that they felt would be important to consider for recovery in the Blean. These species categories were 'ecosystem engineer/keystone', 'flagship', 'umbrella', and 'other'.

The facilitators then split the participants into three breakout groups. Participants were assigned into breakout groups by the facilitators to ensure diverse sector representation in each group and gender balance. Each group then built one alternative by selecting a combination of species from the lists of brainstormed species from the flipcharts that they would like to consider together for recovery in the Blean. The number of species included in each set was not restricted, but groups were encouraged to consider feasibility of implementation, including budget and logistical constraints. This resulted in a rapid prototype of the decision problem with three alternatives to compare.

Outcomes & Discussion

Some species were listed in multiple categories, but a total of 35 individual species and four species groups (woodpeckers, worms, ants, fungi) were brainstormed at this stage (**Table 2**). Two of the 35 species were domestic animals that are commonly used in rewilding programmes – Iron-Age pigs and Exmoor ponies.

The three alternatives, or species sets, built by the breakout groups contained either 6 or 7 species, with Set 1 also including a broader taxonomic group of "Deciduous woodland beetles" (**Table 3**). Across all sets, 13 species or species groups were represented. Five of these species featured in more than one set, with Eurasian beaver being chosen by all three groups (**Table 3**).

Overall, participants felt that it was difficult to categorise species, especially when the categories were not mutually exclusive, and that it was difficult to brainstorm species for taxa that the collective workshop group was less familiar with, particularly plants and invertebrates. Although two domestic species, Iron-Age pigs and Exmoor ponies were brainstormed, the group decided not to include these in the species sets and to focus only on wild species.

Table 2. *Species and species groups that were rapidly brainstormed by workshop participants as the species they viewed as important for consideration for recovery or reintroduction in the Blean.*

Flagship	Ecosystem engineer/keystone	Umbrella	Other
Adder	Ant spp.	Atlantic salmon	Adder
Badger	Beaver	Bittern	Eurasian jay
Beaver	Bison	Elk (moose)	Exmoor pony
Bison	Dung beetle	Emperor dragonfly	Iron-Age pig
Black stork	Fungi spp.	European eel	Woodpecker spp.
Golden eagle	Lynx	Nightingale	Worm spp.
Goshawk	Pine marten	Red-backed shrike	
Grey squirrel	Red deer	Turtle dove	
Hazel dormice	Roe deer	White-clawed crayfish	
Heath fritillary	Wild boar		
Hedgehog			
Nightingale			
Parakeet			
Pine marten			
Purple empress			
Red squirrel			
Stag beetle			
Tawny owl			
Wild cat			
Wild service			

Table 3. *Species sets (alternatives) built by each of the breakout groups using the species listed from the brainstorming exercise. Species featured in multiple sets are colour-coded in bold font.*

Set 1	Set 2	Set 3
"Deciduous woodland beetles"	Dung beetles	**Eurasian beaver**
Eurasian beaver	**Eurasian beaver**	**Heath fritillary**
Hazel dormouse	European hedgehog	**Nightingale**
Pine marten	**Heath fritillary**	Red deer
Red squirrel	**Turtle dove**	**Red squirrel**
Nightingale	Woodpeckers	Wild boar
Turtle dove		

Consequences

Background

To choose between alternatives, the consequences of implementing each alternative need to be predicted for each fundamental objective. Thus, it is necessary to determine a way to measure each objective. The identified metrics are herein referred to as performance attributes. Once the performance attributes are decided, and the predictions made, the outputs can be displayed in a consequence table that shows how each alternative performs for each fundamental objective.

Exercises

First, through group discussion, a set of performance attributes was developed to measure the fundamental objectives (**Table 4**). Then, in the same three breakout groups, groups predicted the outcomes of each species set for each performance attribute of the fundamental objectives (**Table 5**).

Outcomes & Discussion

No quantitative analyses were conducted on the scores presented in the consequence table, but it was clear from colour grading the outcomes that there was no clear winning set for any of the groups (**Table 5**). Thus, a compromise (trade-off) would be needed to pick a species set. There was also some uncertainty in the scoring by each group, highlighting the need to delve deeper into the attributes and scoring in the following days of the workshop.

Table 4. *Fundamental objectives with each performance attribute explained.*

Fundamental objective	Performance attribute	Scale
Maximise ecosystem functionality in the Blean	Number of functional species Number of different, new functions	Integer Integer
Maximise biodiversity in the Blean	Number of species	Integer
Maximise happiness of people	Relative rank of how happy/unhappy each species set would make the public	:) = most happy :/ = moderate happiness :(= least happy
Minimise management effort	Relative rank of level of effort required to manage the species in the set	1 = least effort 2 = medium effort 3 = most effort
Minimise negative impacts to native resident species	Relative rank of the level of expected negative impacts on other species	1 = lowest impact 2 = medium impact 3 = highest impact
Minimise cost	Relative rank of the cost of recovering/ reintroducing the entire species set	£ = cheapest ££ = moderate cost £££ = most expensive

Table 5. *Consequence table showing each group's prediction for each species set across the fundamental objectives. Predictions in darker green are those that perform best for that objective across the three species sets for each group. The key for interpreting the scores of each objective can be found in* ***Table 4****.*

		Maximise ecosystem functionality		Maximise biodiversity	Maximise peoples' happiness	Minimise management effort	Minimise negative impact on resident, native species	Minimise cost
		# functional species	*# different new functions*	*# species*	*:) or :/ or :(*	*1, 2, 3*	*1, 2, 3*	*£, ££, £££*
Group 1	**Set 1**	6	8	7	:)	3	2	£££
	Set 2	6	9	6	:|	1	1	£
	Set 3	5	10	6	:(	2	3	££
Group 2	**Set 1**	6	3	7	:/	2	3	££
	Set 2	5	2	6	:)	1	1	£
	Set 3	4	2	6	:(	3	2	£££
Group 3	**Set 1**	3	0	3*	:/	3	1**	£££
	Set 2	2	0	1*	:)	1	1**	£
	Set 3	3	0	3*	:(	2	1**	££

* Group 3 interpreted the number of species as the number of new species that would be added to the Blean, rather than a simple count of the total number of species in the set.

** Group 3 did not predict the negative impact on resident species on a relative scale and instead listed all three sets as having a low negative impact on resident, native species.

8. Stage 2-5: Detailed

Objectives

Exercises

Following the discussions from Day 1, another in-depth discussion was held with the group on Day 2 to refine the fundamental objectives. One major element of this discussion surrounded public support with a live mind-mapping of the key elements that people care about and how the species prioritised might affect these (**Figure 5**).

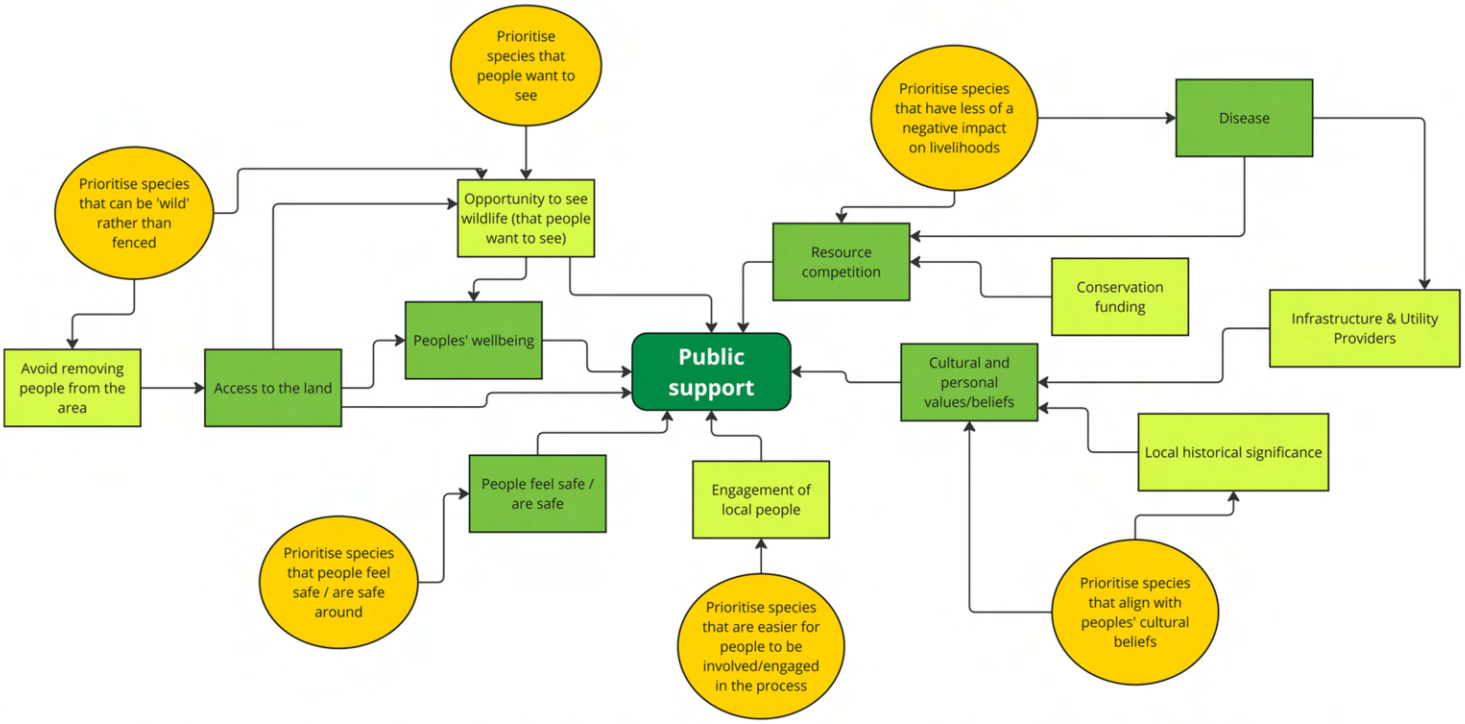


Figure 5. *A mind map created live in the workshop to run through the important elements of public support (green boxes) and how the types of species prioritised (yellow circles) would affect each of these.*

Outcomes & Discussion

The fundamental objectives from Day 1 were refined into the following five fundamental objectives:

- Maximise species value
- Maximise public support
- Maximise naturalness
- Maximise net positive impact on other native species
- Minimise cost

Maximise naturalness pertained to the participants valuing the type and extent of management required for different species and how this would affect how 'natural' a system felt. A key element of the naturalness objective was that participants perceived fencing off an area as not natural, and this fed into the scores of how long management would be ongoing for i.e. longer management if permanent fencing required as is the current case for some large mammals under consideration.

Three of the objectives were further broken down into sub fundamental objectives (**Figure 6**). **Maximise species value** was broken down into considering whether a species performed a key ecosystem function, served as a flagship/champion species, held conservation importance, and/or was of intrinsic value due to being missing in the system. When a species performed a key ecosystem function, it was considered whether this was a new function or not, i.e. whether the function was currently well-represented or poorly represented in the Blean. For species important for conservation, it was further distinguished whether this was at a local scale (i.e. for species conservation in the Blean/Kent) or at a wider scale (i.e. for conservation of national or international significance). The five elements of **public support** that participants felt were crucial to consider were resource use (whether the species would have a financial cost or benefit to different stakeholder groups), access to the Blean, public safety, emotional connection to nature, and ethics/culture (i.e. whether people would support or oppose different species based on ethical and cultural values). The **impact on other native species** was broken down into the gain and loss of these species.

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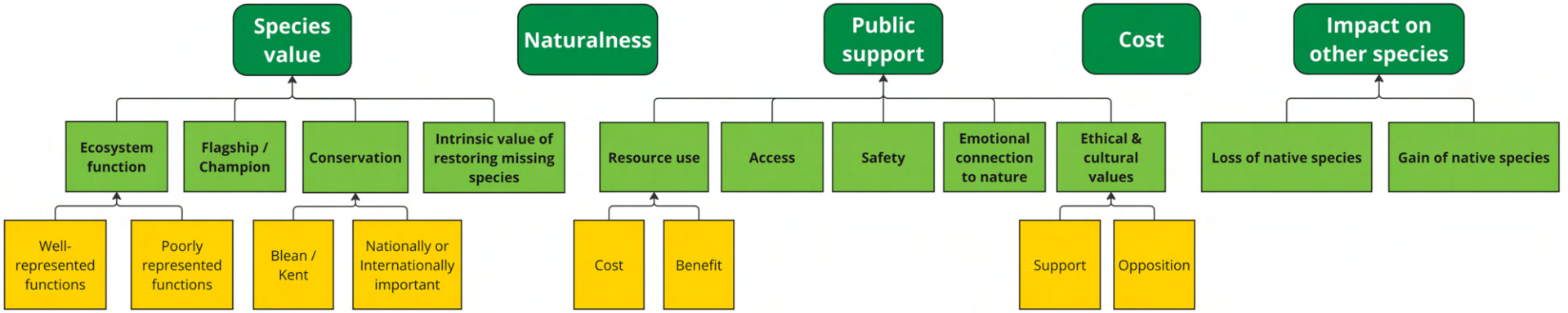

Figure 6. *Fundamental objectives hierarchy showing the theme of each fundamental objective (dark green boxes) with the two tiers of sub fundamental objectives (light green and yellow boxes) that feed into the overarching fundamental objectives.*

Species Shortlisting

Overview

Before alternatives (species sets) could be developed, the longlist of ca. 1400 species needed to be reduced to a more manageable list of candidate species to choose from (**Figure 7**).

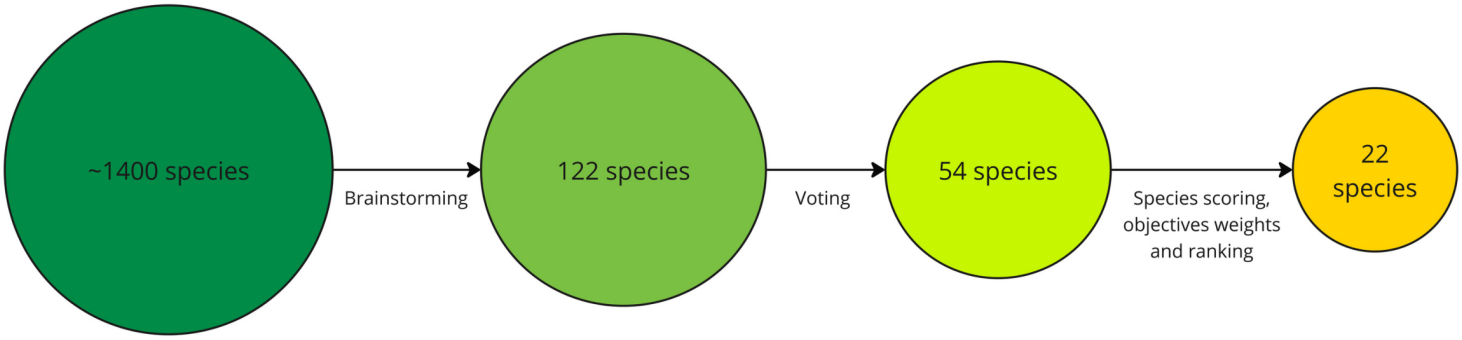

Figure 7. *Overview of the species shortlisting process that was undertaken in the workshop.*

Brainstorming

A longlist of approximately 1400 species was drafted by Kent Wildlife Trust. This list included species with current or historical records (from Kent & Medway Biological Records Centre) from the Wilder Blean area (see **Figure 4**) and species deemed to be missing from Kent that the Wilder Blean could support (i.e. potential candidates for reintroduction or conservation reintroduction). To understand commonalities with the Local Nature Recovery Strategy (LNRS), the list was also cross-referenced with a preliminary longlist of LNRS priority species, although this did not influence the selection process. Workshop participants were given this list of ca. 1400 species and asked to choose the species they thought should be considered. This was conducted by splitting the participants into four groups and asking them to move between four flipcharts. To ensure a broad representation of taxa, each flipchart was dedicated to different species categories: Mammals and Birds; Invertebrates; Plants and Fungi; and Fish and Herpetofauna (reptiles and amphibians). This process produced a list of 126 species or species groups. This list was then refined to 122 species with the removal of some species (e.g. if they were non-native species or if their habitat requirements would not have been fulfilled in the Blean landscape) and the addition of others that the group felt had been missed. The full list of these 122 species can be found in **Table A2** of the Appendix.

Voting

To further narrow down this midlist of 122 species to a more manageable set of approximately 50 species, participants (n=8) were asked to independently, and anonymously, vote for species. Each participant received 50 votes. Of these 50 votes, 20 had to be distributed evenly across the four taxa categories (so five votes within each category) to help ensure taxonomic diversity. The remaining 30 votes could be allocated to any species in any taxa category. Only one vote per species was permitted. The votes were then counted and the species that received at least four votes each (i.e. half or more of participants voted for the species) were retained to produce a list of the most popular species (**Table 6**). Two of these species, the willow tit (*Poecile montanus*) and bird's-nest orchid (*Neottia nidus-avis*) were later removed from the list through group discussion. It was also decided to add European bison (*Bison bonasus*) to the list given it has already been introduced to the Blean, and elk (*Alces alces*) as it is on the current list of potential priority species for Kent Wildlife Trust. This created a shortlist of 54 species, comprised of 6 herpetofauna/fish, 10 invertebrates, 32 mammals/birds and 6 plants/fungi (**Table 6**).

It was noted during the workshop that there were a few instances of double voting due to the setup of the voting system that enabled people to vote for the same species twice by accident. These votes were still counted in the workshop to ensure all 50 votes per participants were included. However, following the same procedure as in the workshop but removing the duplicate votes would have created the same list of species but without sand lizard (*Lacerta agilis*) or narrow-headed ant (*Formica exsecta*). The use of a participant's votes on the same species also means that some votes for other species have been lost, and it is not possible to know if this would have resulted in the addition of any other species to the shortlist. These differences are highlighted in **Table 6**, but for the purposes of the report, the results shown are those from the workshop where sand lizard and narrow-headed ant were included in the final list.

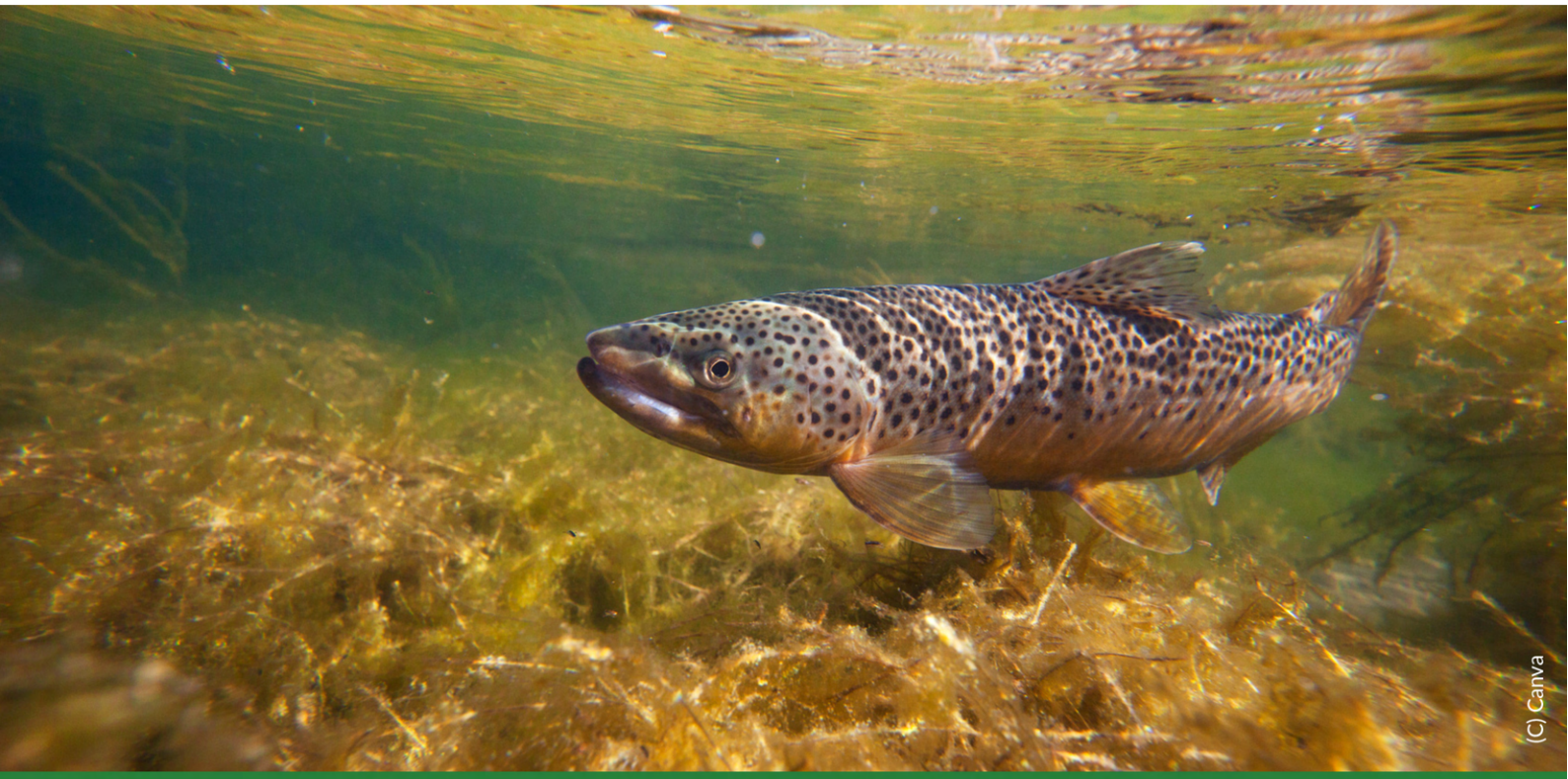

Table 6. *The species shortlisted from the initial list of ca. 1400 through a process of group brainstorming and voting. Species highlighted in red were later removed from the list through group discussion and those in blue were added manually to produce a final shortlist of 54 species. Species highlighted in yellow would have been removed from the shortlist had the duplicate votes been discounted in the workshop. However, this was not done during the workshop, so these species highlighted in yellow were included in the shortlist of 54 species.*

Species	Category	Votes	Votes (duplicates removed)
European eel (*Anguilla anguilla*)	Herps & Fish	10	8
Brown trout (*Salmo trutta*)	Herps & Fish	6	6
European adder (*Vipera berus*)	Herps & Fish	6	6
Great crested newt (*Triturus cristatus*)	Herps & Fish	5	5
European bullhead (*Cottus gobio*)	Herps & Fish	4	4
Sand lizard (*Lacerta agilis*)	Herps & Fish	4	3
White-clawed crayfish (*Austropotamobius pallipes*)	Invertebrates	7	7
Heath fritillary (*Melitaea athalia*)	Invertebrates	6	6
Shrill carder bee (*Bombus sylvarum*)	Invertebrates	6	6
Black-backed meadow ant (*Formica pratensis*)	Invertebrates	5	4
Duke of Burgundy (*Hamearis lucina*)	Invertebrates	5	4
Green-eyed hawker (*Aestina isoceles*)	Invertebrates	5	5
Horned dung beetle (*Copris lunaris*)	Invertebrates	5	5
Glow worm (*Lampyris noctiluca*)	Invertebrates	4	4
Narrow-headed ant (*Formica exsecta*)	Invertebrates	4	3
Woodland spiders	Invertebrates	4	4
Eurasian red squirrel (*Sciurus vulgaris*)	Mammals & Birds	8	7
Common nightingale (*Luscinia megarhynchos*)	Mammals & Birds	7	7
Eurasian beaver (*Castor fiber*)	Mammals & Birds	7	7
European water vole (*Arvicola amphibius*)	Mammals & Birds	7	7
Wild boar (*Sus scrofa*)	Mammals & Birds	7	7
European pine marten (*Martes martes*)	Mammals & Birds	6	6
Lesser spotted woodpecker (*Dendrocopus minor*)	Mammals & Birds	6	6
Bechstein's bat (*Myotis bechsteinii*)	Mammals & Birds	5	5
Black stork (*Ciconia nigra*)	Mammals & Birds	5	5
Eurasian lynx (*Lynx lynx*)	Mammals & Birds	5	5
European nightjar (*Caprimulgus europaeus*)	Mammals & Birds	5	5
European turtle dove (*Streptopelia turtur*)	Mammals & Birds	5	5
Goshawk (*Accipiter gentilis*)	Mammals & Birds	5	5
Red deer (*Cervus elaphus*)	Mammals & Birds	5	5
Red-backed shrike (*Lanius collurio*)	Mammals & Birds	5	5
Western marsh harrier (*Circus aeruginosus*)	Mammals & Birds	5	5
Barbastelle bat (*Barbastella barbastellus*)	Mammals & Birds	4	4
Corncrake (*Crex crex*)	Mammals & Birds	4	4
Dartford warbler (*Sylvia undata*)	Mammals & Birds	4	4
Daubenton's bat (*Myotis daubentonii*)	Mammals & Birds	4	4
Eurasian golden oriole (*Oriolus oriolus*)	Mammals & Birds	4	4
Eurasian otter (*Lutra lutra*)	Mammals & Birds	4	4
Eurasian woodcock (*Scolopax rusticola*)	Mammals & Birds	4	4
European polecat (*Mustela putorius*)	Mammals & Birds	4	4
European wildcat (*Felis sylvestris*)	Mammals & Birds	4	4
Serotine bat (*Eptesicus serotinus*)	Mammals & Birds	4	4
Spotted flycatcher (*Muscicapa striata*)	Mammals & Birds	4	4
White stork (*Ciconia ciconia*)	Mammals & Birds	4	4
White-tailed eagle (*Haliaeetus albicilla*)	Mammals & Birds	4	4
Willow tit (*Poecile montanus*)	Mammals & Birds	4	4
Elk (*Alces alces*)	Mammals & Birds	2	2
European bison (*Bison bonasus*)	Mammals & Birds	2	2
True fox-sedge (*Carex vulpina*)	Plants & Fungi	7	6
Common hornbeam (*Carpinus betulus*)	Plants & Fungi	6	6
Water violet (*Hottonia palustris*)	Plants & Fungi	6	5
Bird's-nest orchid (*Neottia nidus-avis*)	Plants & Fungi	5	5
Wild service tree (*Sorbus torminalis*)	Plants & Fungi	5	5
Butcher's-broom (*Ruscus aculeatus*)	Plants & Fungi	4	4
Giant funnel (*Aspropaxillus giganteus*)	Plants & Fungi	4	4

Species scoring

Each of the 54 species was then scored against the fundamental objectives. To do so, performance attributes for each subobjective of the fundamental objectives needed to be discussed and agreed upon. Some of the performance attributes were modified during the scoring of the first couple of species but the final attributes and their scales are detailed in **Table 7**. To help participants with estimating the cost and management effort for each species, the type of management actions required for each species were also elicited. The types of management actions were broadly grouped and agreed upon as:

- Translocation
- Minor infrastructure required
- Major infrastructure required
- Minor habitat modification
- Major habitat modification
- Supplementary feeding
- Artificial nests/dens/burrows
- Species control
- Legal obligations
- Low intensity monitoring
- High intensity monitoring
- Public management
- Land acquisition

Due to the time required to score all 54 species against all the objectives, this task was split into stages. First, the whole group agreed upon on the management actions required for each species and then predicted the associated cost and naturalness. Then, the participants were split into two groups based on their expertise with one group predicting the consequences for the biological objectives and the other group predicting the consequences for the social objectives.

(C) Michel Viard

Table 7. *The objectives and performance attributes that each of the 54 species were scored for.*

Objective	Subobjective theme	Performance Attribute	Scale
Minimise cost	Cost	Coarse, estimated cost of management for this species on a discrete scale (£ millions)	**0, 0.1, 0.5, 1, 5,10, 20, 50**
Maximise species value	Species value	Total number of categories this species satisfies	**1 - 4** (of Ecosystem function, Flagship species, Conservation, Missing species)
	Extent of well-represented ecosystem function	Discrete scale of how extensive the ecosystem function would be in the Blean	**0** = No key ecosystem function performed **1** = Function is performed by species over less than 25% of the area **2** = Function is performed by species between 25% and 75% of the area **3** = Function is performed by species over more than 75% of the area
	Extent of poorly represented ecosystem function	Discrete scale of how extensive the ecosystem function would be in the Blean	**0** = No key ecosystem function performed **1** = Function is performed by species over less than 25% of the area **2** = Function is performed by species between 25% and 75% of the area **3** = Function is performed by species over more than 75% of the area
	Conservation	Discrete scale of what spatial extent the conservation is important for (only if Conservation was counted for Species Value)	**A** = Blean/Kent **B** = National/International **C** = Both
Maximise naturalness	Naturalness	Discrete scale of how much management is required for each species	**1** = can stop management within the 10-year timeframe **2** = need management for the next 10-25 years (stops within this timeframe) **3** = needs ongoing management after those 25 years (beyond 2050)

Table 7 cont.

Objective	Subobjective theme	Performance Attribute	Scale
Maximise net positive impact on other native species	Positive impact on other, native species	Customised EICAT scale (see Appendix Figure A1)	**1** = Minimal **2** = Minor **3** = Moderate **4** = Major **5** = Massive
	Negative impact on other, native species	EICAT scale (see Appendix Figure A1)	**1** = Minimal **2** = Minor **3** = Moderate **4** = Major **5** = Massive
Maximise public support	Access to the Blean	Percentage of currently unrestricted area that becomes restricted to any land user because of the management of this species	**0 - 100%**
	Human safety	Binary response of whether there is a real or perceived concern for safety to humans (or pets) from the presence or management of this species	**0** = No **1** = Yes
	Emotional connection	Binary response of whether the public will have a strong positive emotional connection to the species	**0** = No **1** = Yes
	Resource loss	Total number of stakeholder groups that could reasonably argue that they would suffer a financial loss from this species	**0 – 7** (of land users, land holders, local partner organisations, other conservation organisations, regulators, infrastructure & utilities, residents)
	Resource gain	Total number of stakeholder groups that could reasonably argue that they would receive a financial gain from this species	**0 – 7** (of land users, land holders, local partner organisations, other conservation organisations, regulators, infrastructure & utilities, residents)
	Ethical & cultural support	Total number of stakeholder groups that might actively support this species (for reasons other than financial gain)	**0 – 7** (of land users, land holders, local partner organisations, other conservation organisations, regulators, infrastructure & utilities, residents)
	Ethical & cultural opposition	Total number of stakeholder groups that might actively oppose this species (for reasons other than financial gain)	**0 – 7** (of land users, land holders, local partner organisations, other conservation organisations, regulators, infrastructure & utilities, residents)

Objectives weights

Once the full consequence table had been completed for these 54 species, participants were asked to weight each of the fundamental objectives and subobjectives. The fundamental objective of Cost was not incorporated at this stage to avoid having only the cheaper species being shortlisted and because cost is important when considering a full species set rather than individual species. To get objective weights, participants were asked to split 100 points between the different groups of objectives at each level of the hierarchy in **Figure 6** based on how much they cared about each one relative to the others. For example, participants had to split 100 points between the four overarching fundamental objectives (excluding cost), as well as to split 100 points between how much they cared about ecosystem functions brought by species being well-represented versus poorly represented (see **Figure 8** for an example). These weights were elicited irrespective of the predicted consequences. The weights for the top-level fundamental objectives are shown in **Figure 9**. The weights for the subobjectives are shown in the Appendix in **Figure A2**, **Figure A3**, and **Figure A4**.

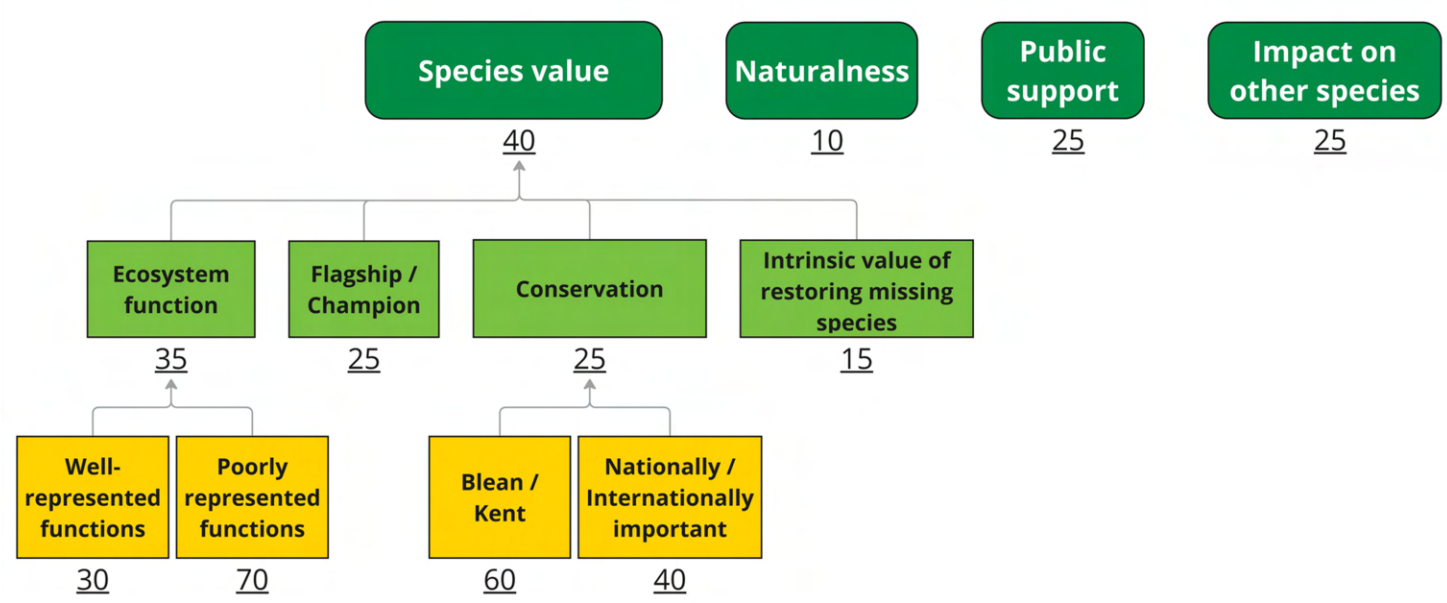

Figure 8. *Fabricated example of the weighting exercise showing how a participant might split their 100 points (underlined) across each group within each level of the fundamental objectives hierarchy. Note that only the fundamental objective of 'Species value' is split into its sublevels for the purpose of this example. In this example, species value is most important to this participant, and within this category, the participant cares more about species that provide ecosystem functions, especially those are currently poorly represented in the Blean.*

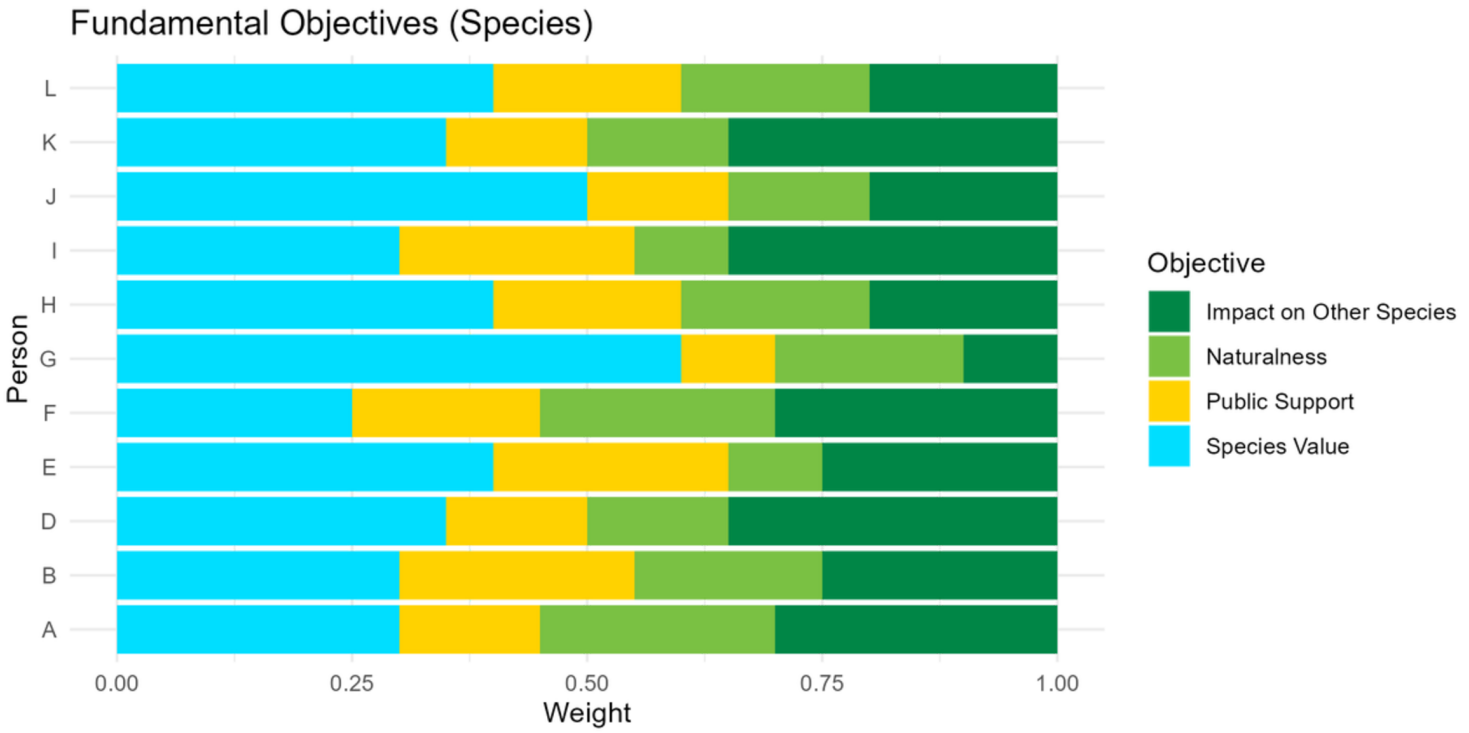

Figure 9. *Each participant's weights for the fundamental objectives showing how much each person valued each objective. Cost was not included as a fundamental objective at this stage as the cost of the species should not be considered when deciding how much utility it has.*

Ranking

We calculated the overall utility score for each species for each participant. The utility score is a value between 0 and 1 that represents how well each species performs with regards to achieving the objectives. The utility score is a function of the elicited attributes of the species, and the weights placed on these attributes by each participant. All attributes were first rescaled to be between 0 and 1, where 0 represents the least desirable plausible outcome for that attribute and 1 the most desirable plausible outcome. For example, for the attribute "Positive impact on other, native species", the maximum plausible value is 5 on the customised EICAT scale, regardless of whether any species scored that high. The rescaled value is then multiplied by the participant's weight for that attribute, generating a utility score for that objective. This is done hierarchically according to the objectives hierarchy consolidated in the workshop (**Figure 6**). The overall utility for each species is the sum of the individual utilities for each objective - see **Figure 10** for an example of how this is calculated.

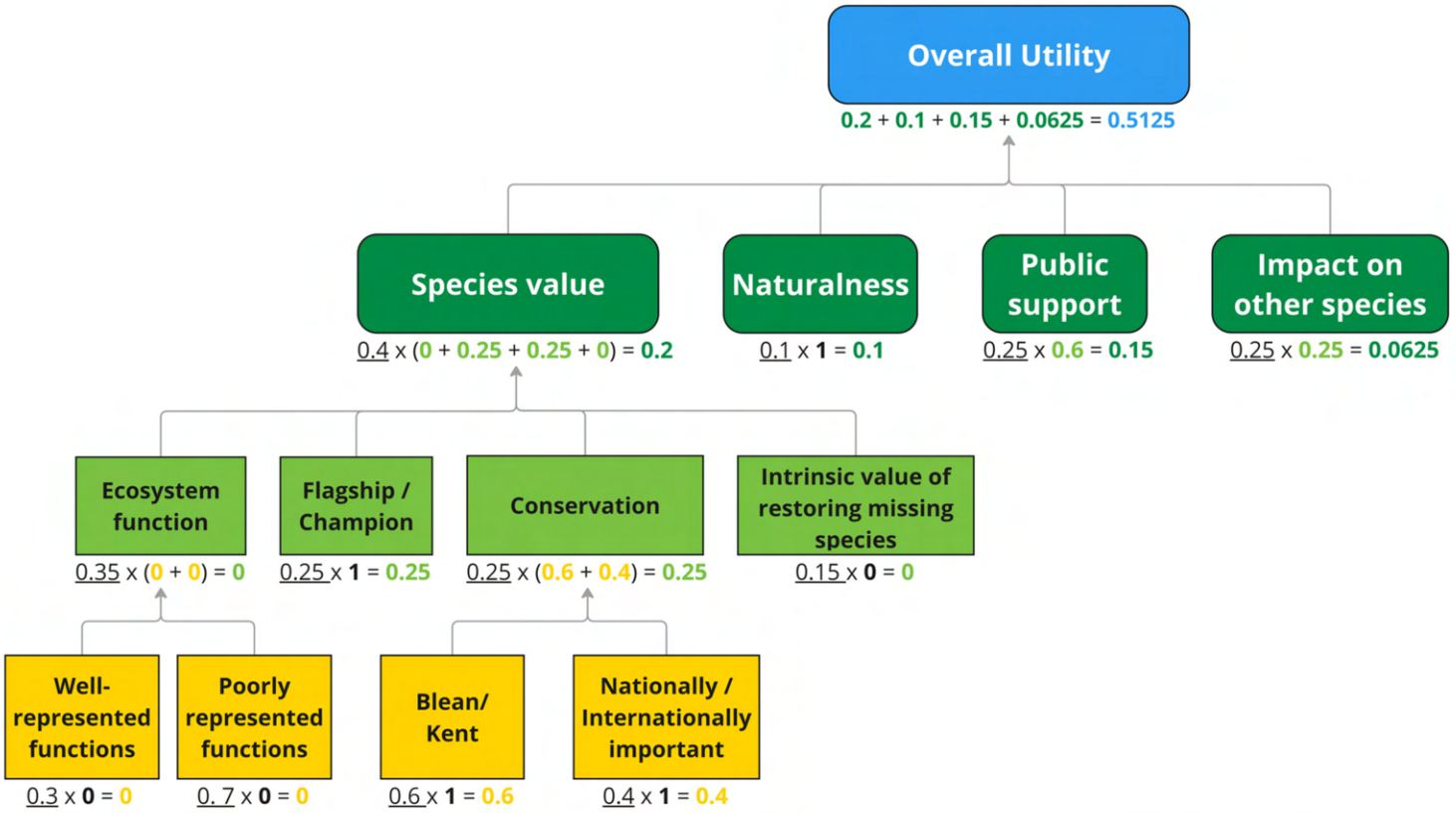

Figure 10. *Example of calculating hierarchical utility per participant using the fabricated weights from **Figure 8**. Overall utility is calculated from the bottom up by multiplying a participant's weights for each objective (black, underlined) by the rescaled consequence value (bold value between 0 and 1) for each objective. Coloured, bold values are the outputs of this utility calculation at that colours' hierarchical level. This utility value is then carried to the next level up until the calculation of the overall utility. In this example, only the sublevels of the 'Species value' fundamental objective are shown but note that 'Public support' and 'Impact on other species' are also a function of such hierarchical calculations in accordance with the fundamental objectives hierarchy in **Figure 6**.*

After calculating the overall utility score for each of the 54 species for each participant (see **Figure 11** for examples), species were ranked according to the overall utility for each participant separately and the top 20 species of each participant considered (**Figure 12**). The proportion of the top 20 lists that each species was featured in was then calculated and used to determine the final species shortlist. The goal was to obtain a shortlist of approximately 20 species so the species and their proportions were ordered, and all species included until the first step decrease in proportion after 20 species. This produced a shortlist of 22 species (**Table 8**). An update to the scoring for European bullhead (*Cottus gobio*) later meant that this species would have been removed from the list as the proportion decreased from 0.45 to 0.36. However, this was not realised during the workshop, hence all results from herein are those from the workshop that include European bullhead as a candidate species.

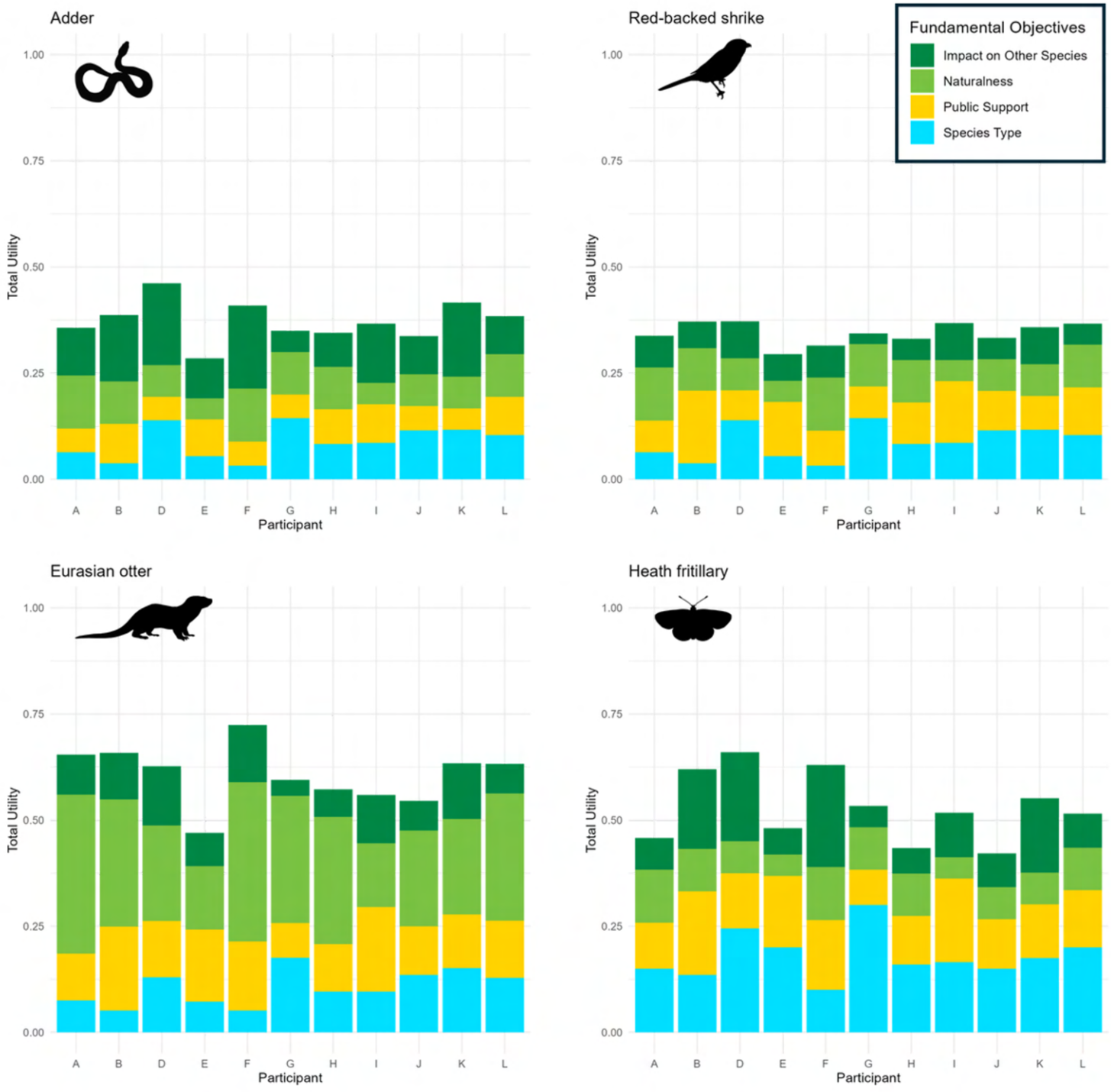

Figure 11. *Examples of the overall utility scores for four of the 54 species showing how the total score is comprised of the four separate scores for each of the fundamental objectives. The differences in height of each subcomponent of the bars shows how the utility score is affected by the weights given to each objective by each participant. Animal silhouettes sourced from phylopic.org.*

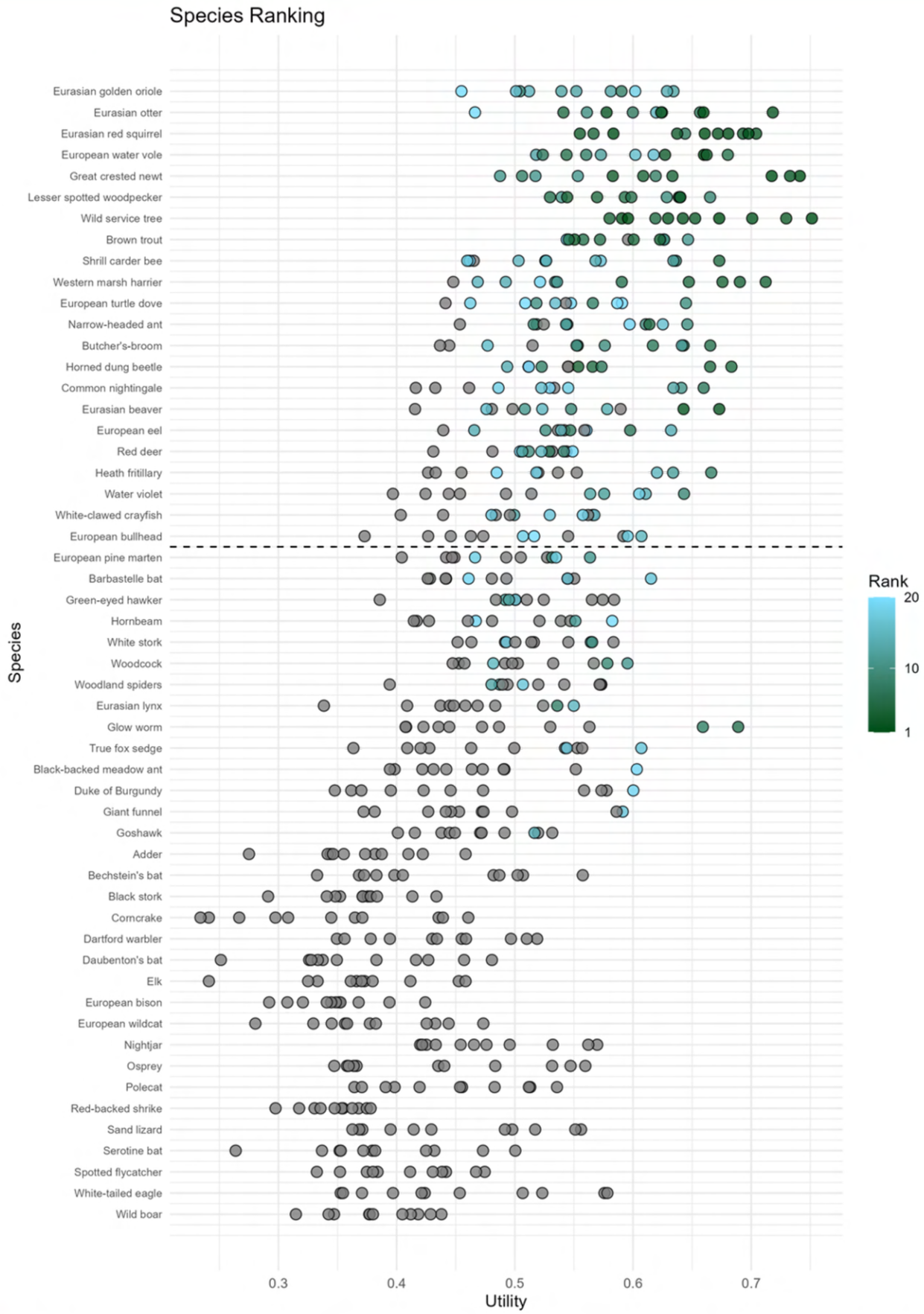

Figure 12. *Overall utility for each species for all of the participants based on the predicted outcomes against each objective and how each participant weighted the objectives. The rank of each species for each participant is denoted by the colour of the point. Grey dots indicate that for this participant the species ranked outside of their top 20. Species that ranked within a participant's top 20 are shown on a blue-green gradient, with higher ranking species in darker green.*

Table 8. *Shortlist of 22 species and the proportion of top 20 lists that each species was featured in across all the participants.*

Species	Proportion of all participants' top 20 lists this species featured in
Eurasian golden oriole (*Oriolus oriolus*)	1
Eurasian otter (*Lutra lutra*)	1
Eurasian red squirrel (*Sciurus vulgaris*)	1
European water vole (*Arvicola amphibius*)	1
Great crested newt (*Triturus cristatus*)	1
Lesser spotted woodpecker (*Dendrocopus minor*)	1
Wild service tree (*Sorbus torminalis*)	1
Brown trout (*Salmo trutta*)	0.91
Shrill carder bee (*Bombus sylvarum*)	0.91
Western marsh harrier (*Circus aeruginosus*)	0.91
European turtle dove (*Streptopelia turtur*)	0.82
Narrow-headed ant (*Formica exsecta*)	0.82
Butcher's-broom (*Ruscus aculeatus*)	0.72
Horned dung beetle (*Copris lunaris*)	0.72
Common nightingale (*Luscinia megarhynchos*)	0.64
Eurasian beaver (*Castor fiber*)	0.64
European eel (*Anguilla anguilla*)	0.64
Red deer (*Cervus elaphus*)	0.64
European bullhead (*Cottus gobio*)*	0.45 / 0.36*
Heath fritillary (*Melitaea athalia*)	0.45
Water violet (*Hottonia palustris*)	0.45
White-clawed crayfish (*Austropotamobius pallipes*)	0.45

* An update to the scoring for European bullhead meant the proportion dropped from 0.45 to 0.36, which would have excluded this species from the shortlist. However, this was not realised during the workshop, so it remains here as a candidate species that was incorporated into the alternatives.

Alternatives

Exercises

Participants were split into two groups and each group was asked to develop two alternatives, or species sets, by choosing a subset of species from the shortlist of 22. No limits on the number of species that could be included were proposed by the facilitators, but groups were encouraged to consider feasibility (e.g. cost and logistics). Each group then fed their alternatives back to the room with explanation as to why they chose those species.

Outcomes

The two groups developed four alternatives around different self-determined themes. Each alternative contained 5 to 9 species, with Eurasian beaver the only species included in all four alternatives (**Table 9**). Set 1 focused on woodland and aquatic species, Set 2 focused on species of conservation concern, Set 3 focused on species that complement each other, and Set 4 focused on species chosen for their diverse ecosystem functions. Three additional alternatives were also added. The first comprised all 22 species on the shortlist. The other two were dictated by the current species being considered by Kent Wildlife Trust for prioritisation. These two alternatives represent the 2030 Vision for Kent Wildlife Trust and the 2030+ Vision, which includes three additional species to the 2030 Vision. These two alternatives include species that were not in the final shortlist of 22 species developed during the workshop but were in the longer list of 54 species that were brainstormed and voted on.

Table 9. *The seven alternatives, or sets of species, that were assessed against the fundamental objectives. Sets 1-4 were developed by the workshop participants choosing species from the shortlist of 22. The themes of each set were determined independently by the groups whereby set 1 focuses on woodland and aquatic species, set 2 focuses on species of conservation concern, set 3 focuses on species that are complement each other, and set 4 focuses on species chosen for their diverse ecosystem functions. The full set includes all 22 species. The KWT 2023 Vision and KWT 2030+ Vision are those species being considered by Kent Wildlife Trust for prioritisation and include species that were not in the shortlist developed during the workshop.*

Full set	Set 1 – Wood & Water	Set 2 - Conservation	Set 3 - Complementary	Set 4 - Functions
All 22 (see Table 8)	Brown trout	**Eurasian beaver**	**Eurasian beaver**	Common nightingale
	Eurasian beaver	Eurasian red squirrel	European water vole	**Eurasian beaver**
	Eurasian golden oriole	European water vole	European eel	Eurasian otter
	Eurasian otter	Heath fritillary	European bullhead*	Heath fritillary
	European turtle dove	Lesser spotted woodpecker	White-clawed crayfish	Horned dung beetle
	Horned dung beetle	Shrill carder bee		Lesser spotted woodpecker
	Red deer	Water violet		Narrow-headed ant*
	Wild service tree	White-clawed crayfish		Shrill carder bee
				Wild service tree

KWT 2030 Vision	KWT 2030+ Vision
Eurasian beaver	**Eurasian beaver**
Eurasian red squirrel	Eurasian red squirrel
European bison	European bison
European pine marten	European pine marten
European turtle dove	European turtle dove
Heath fritillary	Heath fritillary
White stork	White stork
	+
	Elk
	Eurasian lynx
	European wildcat

Consequences

Exercises

For each species set, the performance attributes of the individual species needed to be aggregated to produce single values for the set as a whole. For most of the performance attributes in **Table 7** these were simply summed across individual species scores to give a total. For example, the local conservation value for a set was the total number of species in each set that were individually scored as contributing to local conservation. The performance attributes that were not additive in this way were Ecosystem function, Naturalness, and Cost. For the set, the extent of the **Ecosystem functio**n performed was disregarded and instead considered as a binary response of whether each species performed a well-represented ecosystem function or a poorly represented ecosystem function. The number of each species performing each type of function was then summed across the set. **Naturalness** was changed from a scale of 1-3 to a count of how many species were rated a '3' (highest management effort) within each set. The **Cost** for the species sets was determined by summing the cost of each species in the set then discussing as a group whether the cost should be moderated given interacting management efforts for different species in the same sets.

Outcomes & Discussion

The total cost was altered for three of the sets – the Full Set, Set 3, and 2030+ Vision:

- Full Set was discounted by £5 million from £54.3 million to £49.3 million due to overlapping management of brown trout, European eel, European bullhead and white-clawed crayfish.
- Set 3 was discounted by £3.6 million from £21.6 million to £18 million. The reasoning for this was that the cost of European bullhead management would be absorbed in the cost of European eel management and because American mink management for water vole recovery would also benefit white-clawed crayfish.
- 2030+ Vision was discounted by £12 million from £122 million to £110 million to account for needing similar infrastructure for the species and being able to carry out joint consultations.

After discussing the total costs and any other nuances arising from scoring the species sets rather than individual species, a final consequence table was produced showing how each alternative performed against each objective (**Table 10**). Due to many of the attributes being aggregates across species, and, therefore, being functions of the number of species per set, those sets with more species had an implicit advantage for scoring higher on some attributes. This mostly applied to the scoring of the Full Set, which contained all 22 shortlisted species, and so this set is separated by colour in **Table 10**. As with the rapid prototype from Day 1 of the workshop, there was no clear winning set that performed best across all the objectives. Furthermore, it was clear from discussions that not all the objectives were valued equally hence a weighting and trade-offs exercise was conducted next.

Table 10. *Consequence table showing how each alternative scored against the objectives. Values in dark green scored highest, values in pale green scored lowest. Where the Full Set scored highest or lowest this is shown in dark blue and pale blue, respectively, with the next highest and lowest values across the other six objectives highlighted in dark green and pale green. This distinction is made for a fairer comparison across alternatives as many of the attributes are a function of the number of species in the set and the Full Set contains 22 species compared to the other alternatives that have between five and ten species.*

Objectives				Alternatives						
				Full Set	Set 1	Set 2	Set 3	Set 4	2030 Vision	2030+ Vision
Cost	*Cost*	*£ million*		47.8	16.4	31.2	18	6.5	42	110
Species Value	*Well-represented ecosystem functions*	*# of species contributing to an existing function, to any extent*		5	2	1	0	3	1	2
	Poorly represented ecosystem functions	*# of species providing a new ecosystem function, to any extent*		9	5	5	3	4	4	6
	Flagship / Champion	*# of species acting as flagship / champion species*		15	6	7	4	7	6	9
	Local Conservation	*# of species important for conservation in the Blean / Kent*		21	7	8	6	8	6	8
	National Conservation	*# of species important for conservation nationally / internationally*		17	4	8	5	7	7	9
	Intrinsic / Missing	*# of species that are currently missing from the Blean with no other value*		2	1	1	0	0	2	4
Naturalness	*Naturalness*	*# of species requiring management beyond 25 years*		4	1	4	3	1	4	7
Impact on other species	*Gain of native species*	*Sum of the EICAT scores for each species*		46	21	18	16	18	20	29
	Loss of native species	*Sum of the EICAT scores for each species*		38	20	12	11	17	17	28
Public support	*Access*	*Total % of currently unrestricted area that would become restricted to any land user*		11	1	10	5	5	5	12
	Safety	*# of species posing a perceived or real threat to human (or pet) safety*		1	1	0	0	0	2	5
	Emotional Connection	*# of species that the public would have a strong positive emotional connection to*		16	7	6	3	7	5	6
	Resource Cost	*Total number of stakeholder groups (summed across species) that could reasonably argue that they would suffer a financial loss*		7	4	3	3	3	3	7
	Resource Benefit	*Total number of stakeholder groups (summed across species) that could reasonably argue that they would receive a financial gain*		8	4	8	4	4	16	24
	Ethical Support	*Total number of stakeholder groups (summed across species) that might actively support these species*		47	17	25	18	20	19	22
	Ethical Opposition	*Total number of stakeholder groups (summed across species) that might actively oppose these species*		16	11	6	4	4	16	34

Trade-offs

Exercises

To understand how important each objective was to each participant, participants gave weights to each objective in the same way as for the species shortlisting by distributing 100 points across the hierarchical levels of the fundamental objectives (see **Figure 8** for an example). As with the species shortlisting, the overall utility for each set was then calculated by rescaling the raw scores in **Table 10** from 0 to 1 for each attribute, multiplying these values by the participants' weights and then summing these utility scores across all the objectives (see **Figure 10** for an example). The overall utility of each species set was calculated and ranked for each participant separately.

Outcomes & Discussion

Participants' weights for the top-level fundamental objectives are shown in **Figure 13**. The weights for the subobjectives are shown in the Appendix in **Figure A2**, **Figure A3**, and **Figure A4**. There was much variation on the overall utility and rank of the sets, but some general patterns could be discerned (**Figure 14**). The Full Set, Set 1, and Set 4 performed the best with consistently higher utility scores and featuring as all participants' first or second highest ranking species set. Despite scoring the highest on several of the objectives with regards to the raw consequence table (**Table 10**), the 2030+ Vision performed the worst with lower utility scores and ranking last amongst the sets for all participants except one (**Figure 14**). This highlights the importance of weighting the objectives by their relative importance to each participant, therefore allowing the expression of a diversity of preferences towards each alternative set.

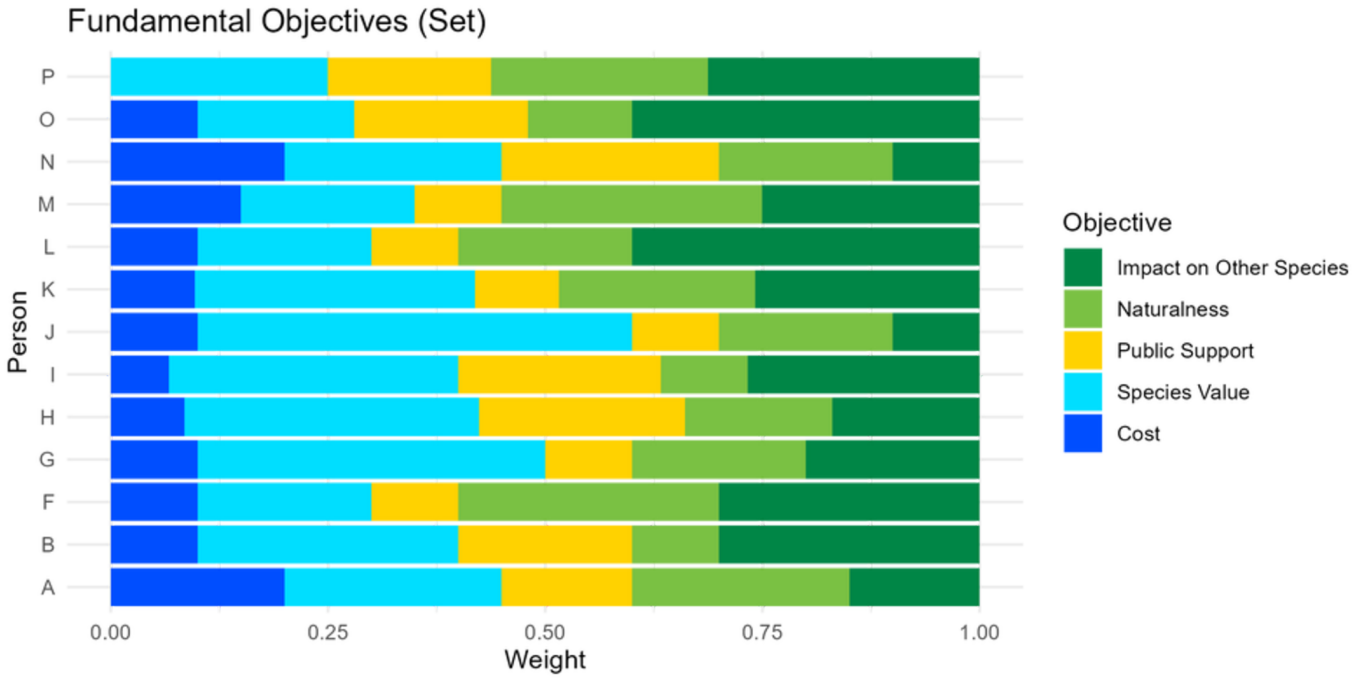

Figure 13. *Each participant's weights for the highest level of the fundamental objectives showing how much each person valued each objective.*

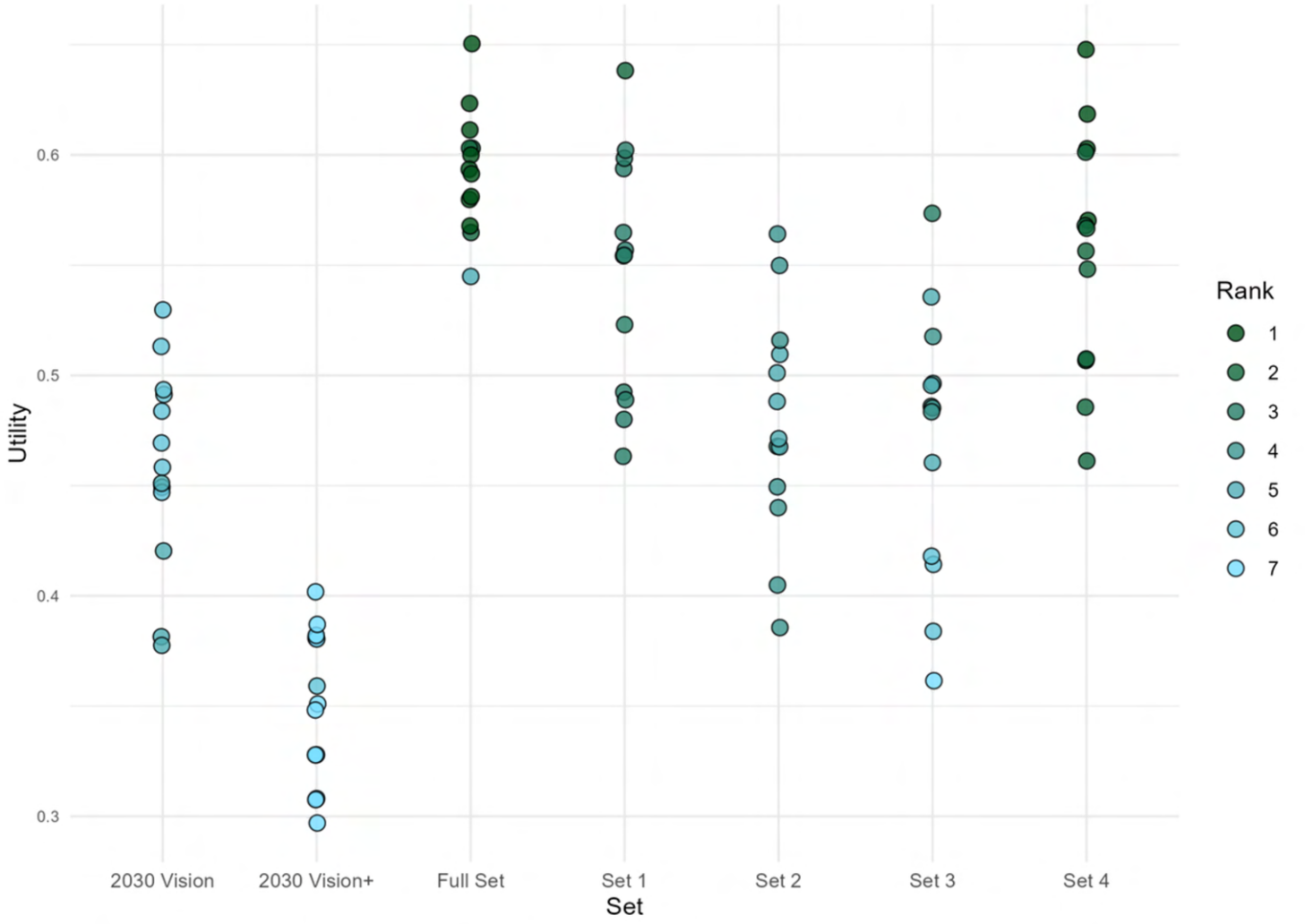

Figure 14. *Overall utility score of each species set for each participant. Each point within a set is the utility score for a single participant with the colour encoding how that set ranked for that individual participant amongst all seven sets.*

9. Discussion & Next Steps

The workshop concluded with a general discussion of the rankings of the alternatives and overall results presented in **Figure 14**. No final decision was made as to which species set to prioritise, but it was notable that workshop participants had similar top-ranking sets despite being from an array of sectors (academia, local and national government, non-governmental organisation, charity, and private consultancy) and expressing varied objective weights. Overall, participants were highly satisfied with the SDM process and outputs with an optimistic outlook on how to move forwards and iterate through the SDM cycle again when necessary.

Future iterations of this process could include updating the species that were shortlisted. The SDM process is a balance between scientific rigor and practical utility, with the number of workshop participants often constrained to a number that is manageable by the facilitators, often no more than 20 individuals. As such, it was not possible to engage all subject matter experts in this first workshop. Although the facilitators attempted to ensure a broad representation of taxa were considered, participants acknowledged that it would be beneficial to include people with more specialised knowledge, particularly on plants and invertebrates, in future discussions. Similarly, the participants acknowledged that the stakeholder groups and values represented in the room could be even more diverse and that this might affect how each objective is weighted.

Structured Decision Making is scalable, accommodating timelines that range from a few hours to years, depending on the complexity of the problem, available resources, and the level of detail and compromise that funders and decision-makers are willing to accept. Whilst there is no fixed timeline for completing a full SDM cycle, this four-day period was a relatively short amount of time for the scale of this decision with a starting list of approximately 1400 species . As such, compromises were made and some of the objectives and their performance attributes could be refined in future iterations. In particular, the facilitators acknowledge that the method used to aggregate the individual species scores into overall scores for species sets meant that species sets containing higher numbers of species were more likely to score higher overall. This should be taken into consideration when deciding which species set to prioritise. However, it should also be noted that more species do provide more real value in some instances, and that Set 4 performed almost as well as the Full Set despite containing less than half the number of species. Thus, the performance was not dictated solely by the number of species in the set.

Overall, this process has significantly clarified the decision problem of selecting an appropriate set of species to prioritise for recovery, reintroduction, or conservation introduction in the Wilder Blean landscape. A transparent framework was developed to guide this decision, with all relevant materials (anonymised where necessary) transferred to Kent Wildlife Trust. The iterative nature of SDM allows for flexible updates, enabling Kent Wildlife Trust to adjust the species lists and scoring as new experts are consulted, additional stakeholders become involved, or new species come up for consideration.

Appendix

Brainstorming objectives

Table A1. *Objectives that were brainstormed during the workshop by asking participants to consider what they want to achieve or avoid through species recovery in the Blean.*

Direction	Value
Increase	water quality
Increase	water management
Increase	knowledge on water management / quality
Increase	biodiversity
Foster	environmental sustainability
Promote	planetary citizenship
Ensure	alignment with values
Awareness of	species driven only by those with financial means
Awareness of	species driven by passion
+	missing species
+	harmony
+	acceptability by multiple 'stakeholders'
+	'wildness'
+	public access
+	public/human use
+	coexistence
+	ability for people to see wildlife
+	support for reintroductions (as a tool)
Avoid	overlooking invertebrates / plants / less 'fluffy' species
Ensure	plans fit the Blean into the wider picture
Increase	functionality
Increase	resilience
Reduce	intensive management / 'gardening'
Balance	current and future land use
+	wider landscape approach / broader vision
Align	species with broader landscape goals
Avoid	throwing 'all the eggs into one basket'
Maximise	fit with other broader landscape objectives beyond the Blean
Avoid	offsetting the problem elsewhere
+	climate resilience
+	voice of 'everyone' including minorities in the decision
Increase	number of people involved with nature actions
Increase	connectivity between the Blean and the Weald
Maximise	landscape protection
+	public value and respect for nature
Ensure	public understand their impacts
Maximise	species / landscape connectivity (ability to move/disperse)
Increase	support and collaboration between regulatory authorities, NGOs and local people
Maximise	collaboration between interested parties
Increase	learning from the process
Ensure	reporting on what is found and lessons learned in layman terms
Increase	# of recovered species

Table A1 cont.

Direction	Value
Decrease	conifer plantations
Reduce	non-native invasive species
+	cross-sector working
+	number of successful translocations
Increase	species abundance
Maximise	public value (from species)
Ensure	balance rewilding and bespoke habitat management
Increase	care and connection (people - nature relationships)
Increase	understanding of where people fit in with the nature
Increase	ability for nature to 'pay for itself'
+	sustainability (linked to above - paying for itself)
Create	Blean visitor centre / general environmental educational centre
Increase	distribution of knowledge to others / educational outreach
Consider	green finance options
+	public ownership
Increase	political support
Avoid	removing people from landscapes
Avoid	disconnecting from local voices and perspectives
Increase	inherent value of native species to people
+	public safety / perception of safety
Reduce	pollution
Maximise	nutrient neutrality
Maximise	number of species / taxa benefiting from actions / changes
Maximise	compliance with guidelines
Ensure	compliance with national strategies
Avoid	illegal / ill-planned conservation translocations
Ensure	conservation translocations are integral with local/national plans
Maximise	nature-friendly farming across the farmed landscape

Shortlisting species

Table A2. *Initial list of 122 species that were brainstormed and refined through group discussion from the longlist of ca. 1400 species.*

Common name	Scientific name	Category
Atlantic salmon	*Salmo salar*	Herps & Fish
Brown trout	*Salmo trutta*	Herps & Fish
Burbot	*Lota lota*	Herps & Fish
Common frog	*Rana temporaria*	Herps & Fish
Common lizard	*Zootoca vivipara*	Herps & Fish
European adder	*Vipera berus*	Herps & Fish
European bullhead	*Cottus gobio*	Herps & Fish
European eel	*Anguilla anguilla*	Herps & Fish
European pond turtle	*Emys orbicularis*	Herps & Fish
European tree frog	*Hyla arborea*	Herps & Fish
Grass snake	*Natrix helvetica*	Herps & Fish
Great crested newt	*Triturus cristatus*	Herps & Fish
Palmate newt	*Lissotriton helveticus*	Herps & Fish
Pool frog	*Pelophylax lessonae*	Herps & Fish
Sand lizard	*Lacerta agilis*	Herps & Fish
Slow worm	*Anguis fragilis*	Herps & Fish
Smooth snake	*Coronella austriaca*	Herps & Fish
Sturgeon sp.	*Acipenseridae sp.*	Herps & Fish
Barbastelle bat	*Barbastella barbastellus*	Mammals & Birds
Barn owl	*Tyto alba*	Mammals & Birds
Bechstein's bat	*Myotis bechsteinii*	Mammals & Birds
Bittern	*Botaurus stellaris*	Mammals & Birds
Black grouse	*Lyrurus tetrix*	Mammals & Birds
Black stork	*Ciconia nigra*	Mammals & Birds
Black woodpecker	*Dryocopus martius*	Mammals & Birds
Bullfinch	*Pyrrhula pyrrhula*	Mammals & Birds
Common crane	*Grus grus*	Mammals & Birds
Common nightingale	*Luscinia megarhynchos*	Mammals & Birds
Common swift	*Apus apus*	Mammals & Birds
Corncrake	*Crex crex*	Mammals & Birds
Dartford warbler	*Sylvia undata*	Mammals & Birds
Daubenton's bat	*Myotis daubentonii*	Mammals & Birds
Elk	*Alces alces*	Mammals & Birds
Eurasian beaver	*Castor fiber*	Mammals & Birds
Eurasian eagle owl	*Bubo bubo*	Mammals & Birds
Eurasian golden oriole	*Oriolus oriolus*	Mammals & Birds
Eurasian lynx	*Lynx lynx*	Mammals & Birds
Eurasian red squirrel	*Sciurus vulgaris*	Mammals & Birds
Eurasian woodcock	*Scolopax rusticola*	Mammals & Birds
European badger	*Meles meles*	Mammals & Birds

Table A2 cont.

Common name	Scientific name	Category
European bison	*Bison bonasus*	Mammals & Birds
European hare	*Lepus europaeus*	Mammals & Birds
European hedgehog	*Erinaceus europaeus*	Mammals & Birds
European nightjar	*Caprimulgus europaeus*	Mammals & Birds
European pine marten	*Martes martes*	Mammals & Birds
European polecat	*Mustela putorius*	Mammals & Birds
European turtle dove	*Streptopelia turtur*	Mammals & Birds
European water vole	*Arvicola amphibius*	Mammals & Birds
European wildcat	*Felis sylvestris*	Mammals & Birds
Eursian otter	*Lutra lutra*	Mammals & Birds
Golden eagle	*Aquila chrysaetos*	Mammals & Birds
Goshawk	*Accipiter gentilis*	Mammals & Birds
Greenfinch	*Carduelis chloris*	Mammals & Birds
Grey seal	*Halichoerus grypus*	Mammals & Birds
Harbour seal	*Phoca vitulina*	Mammals & Birds
Harvest mouse	*Micromys minutus*	Mammals & Birds
Hawfinch	*Coccothraustes coccothraustes*	Mammals & Birds
Hazel dormouse	*Muscardinus avellanarius*	Mammals & Birds
Kingfisher	*Alcedo atthis*	Mammals & Birds
Lapwing	*Vanellus vanellus*	Mammals & Birds
Lesser spotted woodpecker	*Dendrocopus minor*	Mammals & Birds
Marsh tit	*Parus palustris*	Mammals & Birds
Osprey	*Pandion haliaetus*	Mammals & Birds
Peregrine falcon	*Falco peregrinus*	Mammals & Birds
Pied flycatcher	*Ficedula hypoleuca*	Mammals & Birds
Red deer	*Cervus elaphus*	Mammals & Birds
Red-backed shrike	*Lanius collurio*	Mammals & Birds
Sandwich tern	*Sterna sandvicensis*	Mammals & Birds
Serotine bat	*Eptesicus serotinus*	Mammals & Birds
Sparrowhawk	*Accipiter nisus*	Mammals & Birds
Spotted flycatcher	*Muscicapa striata*	Mammals & Birds
Tawny owl	*Strix aluco*	Mammals & Birds
Water buffalo	*Bubalus bubalis*	Mammals & Birds
Water shrew	*Neomys fodiens*	Mammals & Birds
Waxwing	*Bombycilla garrulus*	Mammals & Birds
Western marsh harrier	*Circus aeruginosus*	Mammals & Birds
White stork	*Ciconia ciconia*	Mammals & Birds
White-tailed eagle	*Haliaeetus albicilla*	Mammals & Birds
Wild boar	*Sus scrofa*	Mammals & Birds
Willow tit	*Poecile montanus*	Mammals & Birds

Table A2 cont.

Common name	Scientific name	Category
Black hairstreak	*Satyrium pruni*	Invertebrates
Black-backed meadow ant	*Formica pratensis*	Invertebrates
Brindle white spot moth	*Parectropis similaria*	Invertebrates
Brown hairstreak	*Thecla betulae*	Invertebrates
Cocinelle ladybird	*Cocinella distincta*	Invertebrates
Desmoulin's whorl snail	*Vertigo moulinsiana*	Invertebrates
Duke of Burgundy	*Hamearis lucina*	Invertebrates
Glow worm	*Lampyris noctiluca*	Invertebrates
Great yellow bumblebee	*Bombus distinguendo*	Invertebrates
Green-eyed hawker	*Aestina isoceles*	Invertebrates
Heath fritillary	*Melitaea athalia*	Invertebrates
High brown fritillary	*Fabriciana adippe*	Invertebrates
Horned dung beetle	*Copris lunaris*	Invertebrates
Large tortoiseshell	*Nymphalis polychloros*	Invertebrates
Lead coloured pug moth	*Eupithecia plumbeolata*	Invertebrates
Mazarine blue	*Cyaniris semiargus*	Invertebrates
Narrow-headed ant	*Formica exsecta*	Invertebrates
Pearl-bordered fritillary	*Boloria euphrosyne*	Invertebrates
Shrill carder bee	*Bombus sylvarum*	Invertebrates
Small pearl-bordered fritillary	*Boloria selene*	Invertebrates
Tadpole shrimp	*Triops cancriformes*	Invertebrates
Viper's bugloss moth	*Hadena irregularis*	Invertebrates
Water beetle	*Agabus chalconatus*	Invertebrates
White-clawed crayfish	*Austropotamobius pallipes*	Invertebrates
White-letter hairstreak	*Satyrium w-album*	Invertebrates
Wood white	*Leptidae sinapsis*	Invertebrates
Woodland spiders	NA	Invertebrates
Bird's-nest orchid	*Neottia nidus-avis*	Plants & Fungi
Black poplar	*Populus nigra*	Plants & Fungi
Butcher's-broom	*Ruscus aculeatus*	Plants & Fungi
Common hornbeam	*Carpinus betulus*	Plants & Fungi
Creeping marshwort	*Apium repens*	Plants & Fungi
Giant funnel	*Aspropaxillus giganteus*	Plants & Fungi
Grey hair grass	*Corynephorous canescens*	Plants & Fungi
Maiden pink	*Dianthus deltoides*	Plants & Fungi
Sand catchfly	*Silene conica*	Plants & Fungi
Spring speedwell	*Veronica verna*	Plants & Fungi
Spurge laurel	*Daphne laureola*	Plants & Fungi
Starfruit	*Damasonium alisum*	Plants & Fungi
True fox-sedge	*Carex vulpina*	Plants & Fungi
Water violet	*Hottonia palustris*	Plants & Fungi
Wild service tree	*Sorbus torminalis*	Plants & Fungi

EICAT scale

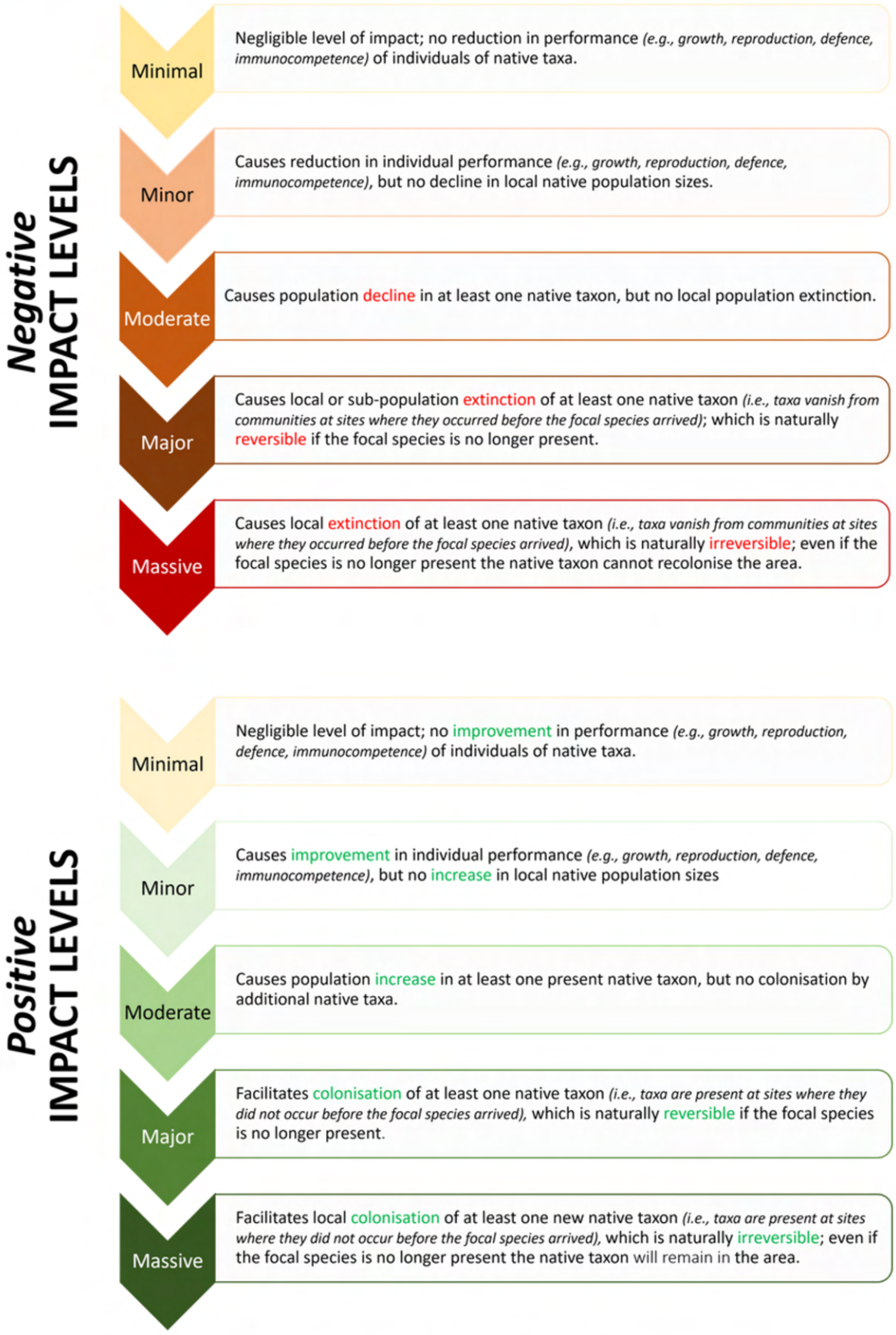

Figure A1. *Customised EICAT scale used to score the impact of each species on other native species. Adapted from: IUCN (2020). IUCN EICAT Categories and Criteria. The Environmental Impact Classification for Alien Taxa First edition. Gland, Switzerland and Cambridge, UK: IUCN.*

Participants' weights

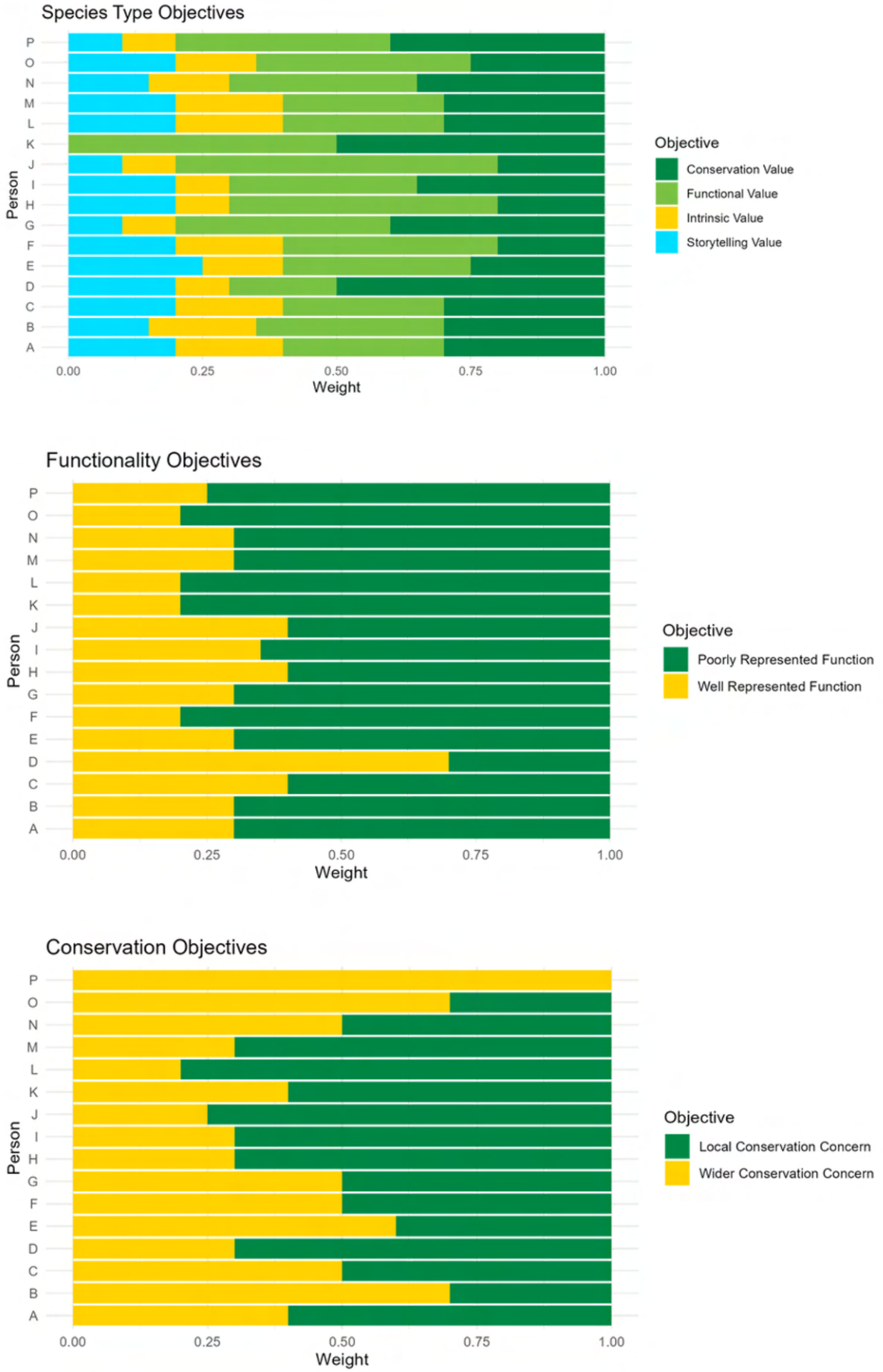

Figure A2. *Weights that each participant gave to each subobjective relating to the fundamental objective of maximising species value.*

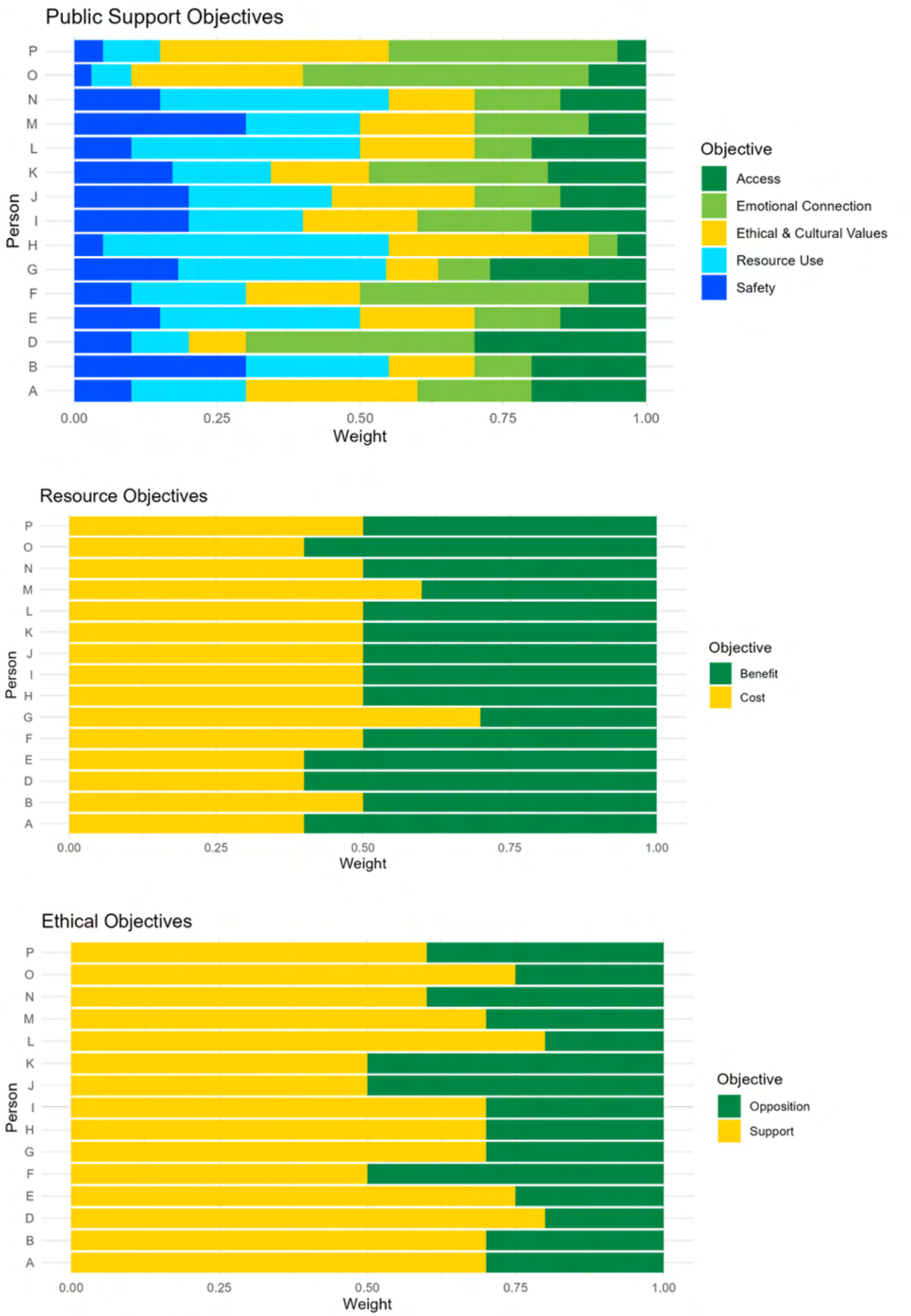

Figure A3. *Weights that each participant gave to each subobjective relating to the fundamental objective of maximising public support.*

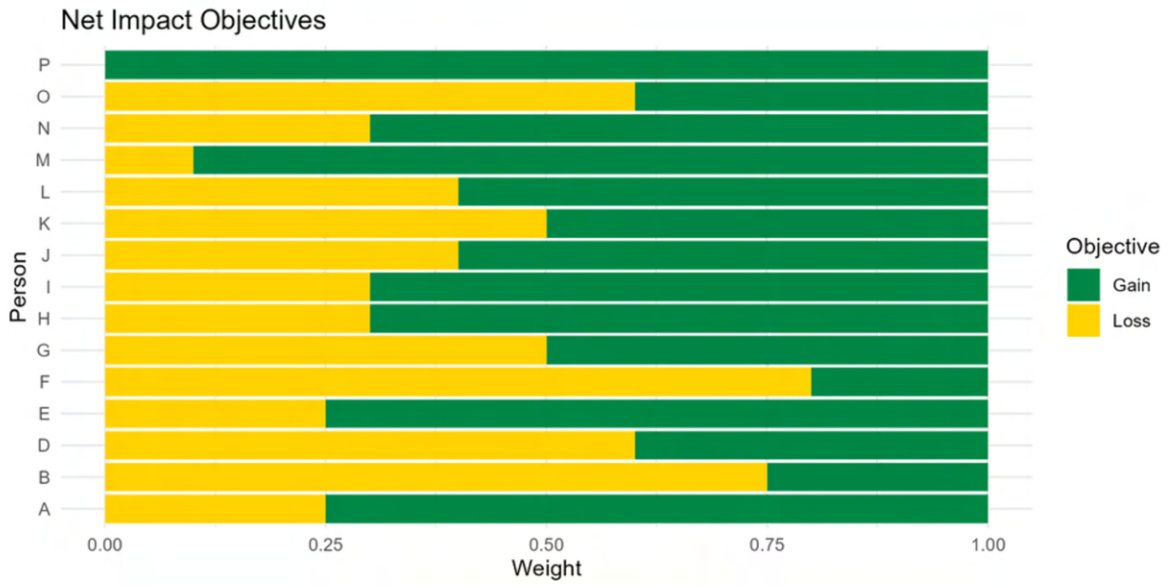

Figure A4. *Weights that each participant gave to the subobjective relating to the fundamental objective of maximising the net positive impact on other native species.*

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