Photo: A camera trap trained on a beaver lodge - © Catherine Wilson

Beavers in licensed enclosures: licensees' objectives, opinions and experiences

July 2023Natural England Evidence Project Report [RP04729]

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Executive summary

Context and Scope

There is widespread interest in reintroducing European beavers (*Castor fiber*) into the English landscape, which was a former part of its historic range. At the time of writing, wild releases are not permitted in England, however, the release of beavers into naturalistic, secured enclosures is permitted under a licence from Natural England. Currently, there are 27 licensed beaver enclosures. Enclosure releases allow beavers to be studied in an English context and provide education and an opportunity to monitor ecological changes and potential conflicts. Despite these potential benefits, there has been little research assessing the attitudes, values and motivations of the licensees. These individuals have been closely observing and monitoring beavers in the English landscape and their experiences may be able to guide future strategies as well as aid monitoring and research. The key aims of this research were to provide evidence on (i) the objectives, opinions, and experiences of licensees and (ii) to understand human and beaver activities occurring in the enclosures.

Mixed methods research was used to assess the two key aims of this project. Qualitative data (words and meaning) was collected through interviews and quantitative data (numbers) was collected in an online survey. Eighteen licensees participated in this research (all from different sites), resulting in 67% of licensed enclosures being considered within this study. Four of the licensees participated in an interview, nine responded to the questionnaire and five participants did the questionnaire and an interview. As there are a small number of licensed beaver enclosures in England (in terms of research sample sizes), combining qualitative and quantitative research was used to provide stronger evidence and increase confidence in this report's findings.

In addition to the licensees' participation in this research, two beaver consultants were interviewed. These were experts that are external from Natural England. The beaver consultants were knowledgeable about beavers in licensed enclosures, had experience setting up licences and provide advice to licensees. The involvement of the beaver consultants in this study allowed the researcher to further understand the two experts' expectations of a licensed enclosure, which in turn highlighted new topics of interest within the two research aims. The beaver consultant interviews were conducted halfway through the licensee interviews (due to availability) and the answers provided influenced the licensee interviews that followed them.

Key findings

An overview of the key findings from the interviews and online questionnaires.

The beavers

- Of the eighteen licensees participating in this research, 50% reported previous beaver escapes. Beavers are normally quickly recaptured and no populations have been established in the wild from enclosure escapes.
- There is a difference in opinion between the licensees (and between the two beaver consultants interviewed) regarding the status of the beavers as wild or captive animals.

The objectives

- Licensees participating in interviews identified seven key objectives for releasing beavers into the enclosure: (1) for ecological purposes, (2) to provide benefit to waterways (including preventing drought and flooding), (3) for engagement purposes, (4) for future wild releases, (5) to advance knowledge, (6) for personal enjoyment, and (7) for the presence of beavers.
- Licensees participating in the online surveys were asked if pre-determined objectives were being monitored and achieved. The pre-determined objectives included flood risk management, improving water quality, restoring natural processes, part of a rewilding project, improving habitat, presence of beavers, improving biodiversity, education and awareness, tourism and visitor attraction, and other. Eighty-seven percent of licensees' objectives were being monitored, and 68% of the objectives have been achieved.

Monitoring

- Licensees participating in interviews supplied eight reasons for why they monitored: (1) beaver welfare, (2) check objectives, (3) enjoyment, (4) licence requirements, (5) engagement purposes, (6) advance knowledge (7) self-motivation, and (8) advise on wild releases.
- A large number of monitoring activities conducted in the enclosures were discussed including: wildlife, beaver welfare and behaviour, habitat and vegetation, hydrology, water quality, fence line and engagement/social monitoring.
- One beaver consultant was concerned that welfare monitoring was not encouraged or required. Welfare monitoring was not fully addressed in this study and should be further examined. Additional guidance would be beneficial to advise on the frequency that welfare checks should be done as well as body conditions and behaviours that should be looked for.

Beaver activities

- A wide diversity of positive beaver behaviours was identified by interviewees. This is supported by three licensees stating their beavers appear calm. There were some accounts of stress behaviours. These should be highlighted as behaviours to look for when providing welfare guidance to licensees.
- Lodges, dams and beaver ponds were the most commonly added artificial structure in beaver enclosures. Eighty-four percent of the artificial structures/modifications installed into enclosures have been used at some point by the beavers.

The future of the enclosures

- Once their current licence had ended, six licensees participating in the online survey and three participants from the in-person interviews wanted to request the release of beavers into the wild. Six online survey respondents wished to extend their current licence and two online survey respondents (and one interviewee) were unsure.
- Some interviewees who wanted to request wild releases after their current licence had ended considered four measures that they thought would improve the success of wild releases; (1) increased collaboration between licensees, stakeholders, the public, Natural England and other potential partners, (2) employment of beaver officers, (3) training and education and (4) the availability of funding for those who may experience conflict.

Contents

1. Introduction

1.1. Beaver status in England

At the beginning of the 20th Century, the population of Eurasian beavers (*Castor fiber*) was found only in a small portion of its historical range and had been reduced to 1,200 individuals (Halley, Rosell & Saveljev, 2012). Historically, beavers were found in Britain but had been extinct from England and Wales since 1300 and from Scotland since 1600 (Raye, 2015). Through widespread reintroductions, the beaver population in Europe has recovered and recent research estimates their minimum population to be between 1.2 million (Wróbel, 2020) and 1.5 million (Halley, Saveljev & Rosell, 2021).

Recent interest in introducing beavers back into the English landscape has started with small populations beginning to be established within enclosures. Wild releases of beavers are not currently authorised in England and lawful reintroductions must occur into secure licensed enclosures. The first release of beavers into a licensed enclosure occurred in 2003, as a habitat management method at Ham Fen Site of Special Scientific Interest in Kent (Heydon and others, 2021). In December 2017, all new releases of beavers into fenced enclosures (excluding those under zoo conditions) required a licence due to a high number of escapes and because enclosures were seen as part of 'the wild' (Heydon, and others., 2021). Previously, enclosure projects had to be issued with three separate licenses; two licences under the Wildlife and Countryside Act (1981) for release and the use of a trap and one under the Conservation of Habitats and Species Regulations (2017) for possession and transport. The licensing process was revised in 2022 to allow a single unified licence to be issued. In the licensing process applicants are expected to include:

- their purpose/motivation for releasing beavers;
- the design and construction of the enclosure;
- how the enclosure will be maintained;
- how they plan to monitor the beavers and manage their welfare;
- the likely effects of beavers on the environment in and around the enclosure;
- how they will prevent beaver escapes and recapture escapees (including the provision to deal with any damage caused) and
- their exit strategy and what will happen to the beavers at the end of the project.

There are currently 27 licensed sites in England where beavers have been released into an enclosure.

1.2. Purpose of this research

There are two key aims of this evidence report:

1. To understand the objectives, opinions and experiences of individuals and organisations that hold a beaver enclosure licence and
2. To understand the human and beaver activities currently occurring in the enclosures.

The first aim will build on the research already conducted on the social perceptions of different river users and stakeholders regarding beaver introductions. This is important as the International Union for the Conservation of Nature (IUCN) and Species Survival Commission (SSC) guidelines on species reintroductions, as well as Defra's code for reintroductions and other conservation translocations, requires projects to consider social feasibility, engage with stakeholders and address concerns (IUCN/SSC, 2013; Defra, 2021). Although research has been conducted on the perceptions of affected groups, such as anglers (Auster, Barr & Brazier, 2021a) and local communities/businesses (Auster, Barr & Brazier, 2020b), there is little research assessing licensees' perceptions. The second aim is to understand the human and beaver activities currently associated with enclosures. This includes the monitoring that the licensees are currently conducting as well as the beaver behaviours they are observing. Understanding ongoing human activities occurring in beaver enclosures (such as monitoring and research) may be beneficial for increasing collaborations and information sharing. Interviews with the licensees may help identify limitations within the licencing process or difficulties in conducting licencing requirements, which will allow Natural England to make informed decisions about strategies for the future of enclosures and how they are managed. Furthermore, the interviews with the beaver consultants (who were external to Natural England) are of particular importance as they allow comparisons to be made regarding the human and beaver activities experts think should be occurring in enclosures with the actual activities taking place in the enclosures and those outlined in the licence requirements.

2. Methods

Three data collection methods were used in this research: (i) licensee interviews, (ii) the licensee survey and (iii) beaver consultant interviews. The lead author collaborated with eight Natural England staff who contributed to the content of the survey (see Section 9.1 for the survey template). The questionnaire was designed and distributed using the software Online Surveys[1]. Two sets of interview guides were created, one for licensees and the other for beaver consultants, which reflect the questions asked in the online survey (found in Section 9.2 and Section 9.3 respectively). Questionnaire and interview participants were questioned on a range of topics relating to the enclosure including their objectives to obtain the licence, monitoring of the enclosure, beaver behaviour, scientific research being conducted and their long-term plans. Data collection was conducted between October and November 2022. All names and contact details for potential research participants were obtained from Natural England Wildlife Licencing Service. All participants were provided with a privacy notice. Interviewees signed a written consent form and survey respondents indicated their consent at the beginning of the survey through a check box. Ethical and GDPR approval was obtained through Natural England. A statement of the researcher's positionality can be found in Section 9.4.

2.1. Data collection

The first stage of this mixed-method research was to identify and approach potential participants for in-person interviews. The criteria for in-person interviews were that the participant must have beavers in a secure enclosure licensed by Natural England Wildlife Licencing Service (NEWLS) and be in close geographical proximity (<200 miles) to the primary researcher. Nine licensees were emailed to ask if they would participate, resulting in four in-person interviews being conducted. In-person interviews were arranged before the online survey was distributed because it was expected to take time to organise site visits and the time available for fieldwork was restricted. It was important for the primary researcher to attend licensed enclosures to fully comprehend the size of the enclosures, understand the difficulties that may be faced by licensees and have an opportunity to further develop the interview guides for future interviews. Licensees who participated in in-person interviews did not take part in the online questionnaire.

Two independent beaver consultants were interviewed online, via Microsoft Teams, during the time frame in which in-person licensee interviews were also conducted. The beaver consultants were external to Natural England and are specialists who assist licensees and

[1] https://beta.jisc.ac.uk/online-surveys

manage beavers. The purpose of the beaver consultant interviews was to obtain expert opinions on best practice guidance and expectations regarding the beaver and human activities occurring in licensed enclosures. Beaver consultant interviews allowed new ideas and questions to be considered which resulted in the development of the licensee interview guide. Questions including ‘how do you monitor for beaver welfare and how frequently’ and ‘do you see the beavers in the enclosure as wild or captive’ were added to the licensee interview guide because of the beaver consultant interviews. For a full list of questions added to the interview guide because of ideas and opinions raised in the licensees' in-person interviews and beaver consultant interviews please see Section 9.2.

Thirty-four individuals and organisations were invited to participate in the online survey via email. A pre-made list of email addresses (compiled by the beaver working group at Natural England) was used. More individuals were contacted than the number of licensed enclosures as some sites had more than one point of contact and some of the individuals included in the email list had shown interest in becoming a licensee but had not yet been granted a licence or had not released any beavers. Fifteen people responded to the survey, one of the respondents had not released beavers into their enclosure and so their answers were removed. This resulted in fourteen surveys being used in this research. Questionnaire respondents were also invited to opt-in to an interview at the end of the survey. Ten survey respondents registered their interest, with five of them participating in an online interview via Microsoft Teams. Questions added to the interview guide, due to conversations with the beaver consultants and in-person interviewees, were asked during these interviews.

Overall, eighteen licensees (all from different sites) participated in this research through in-person interviews, online survey responses and/or online interviews. At the time of writing, there were 27 licensed beaver enclosures in England, meaning the activities of 67% of English licensed beaver enclosures are captured within this study. A timeline of the fieldwork is provided in Table 1. Please note that this has been simplified and there was more overlap in the research stages than described here.

Table 1: Stages of fieldwork in this research.

Stages of Fieldwork
1. Interview guides and questionnaires were created.
2. Ethical Approval was provided by Natural England's Ethics Committee.
3. Nine licensees were invited to participate in in-person interviews.
4. Two beaver consultants were invited to participate in online interviews.
5. The online survey was distributed to 34 licensees.
6. Four in-person interviews were conducted with licensees. Two online interviews were done with beaver consultants. Edits were made to the licensee interview guide during and after the in-person licensee interviews and beaver consultant interviews.
7. The ten survey respondents that showed interest in participating in an online interview were contacted.
8. Five online interviews were conducted with licensees.
9. The questionnaire was closed. Fourteen responses have been used in this report.

2.2. Data analysis

Interview data and qualitative questionnaire results were analysed together using thematic analysis. The first stages of thematic analysis are transcription and familiarisation (Braun & Clarke, 2013, p.202-203). Transcription is when audio interview data is converted into written data. This is then reread to allow the researcher to familiarise themselves with the content. The interview transcripts and qualitative survey answers were uploaded to NVivo, a Qualitative Data Analysis Software, to aid the examination of the data. A hierarchical coding system was used to organise and analyse the data. Data was grouped into the overarching research topics: (1) objectives, (2) monitoring and research, (3) beaver activities, (4) the future of enclosures, (5) details about the enclosure and (6) beaver consultant's interviews. Through rigorous data interrogation, several themes were developed within the 6 research topics. Themes could then be further grouped into categories and sub-categories when required (Figure 1). These themes, categories and

sub-categories have been the foundation of the results reported in Section 3. A word cloud generator was used to create figures to visually display the qualitative results.

Quantitative data from the survey has been analysed descriptively. As sample sizes in this research are small no statistical analysis has been conducted. Instead, trends and relationships in the data have been described and explained using the raw data, percentages and data visualisation (such as bar charts). All graphs produced were created in Excel.

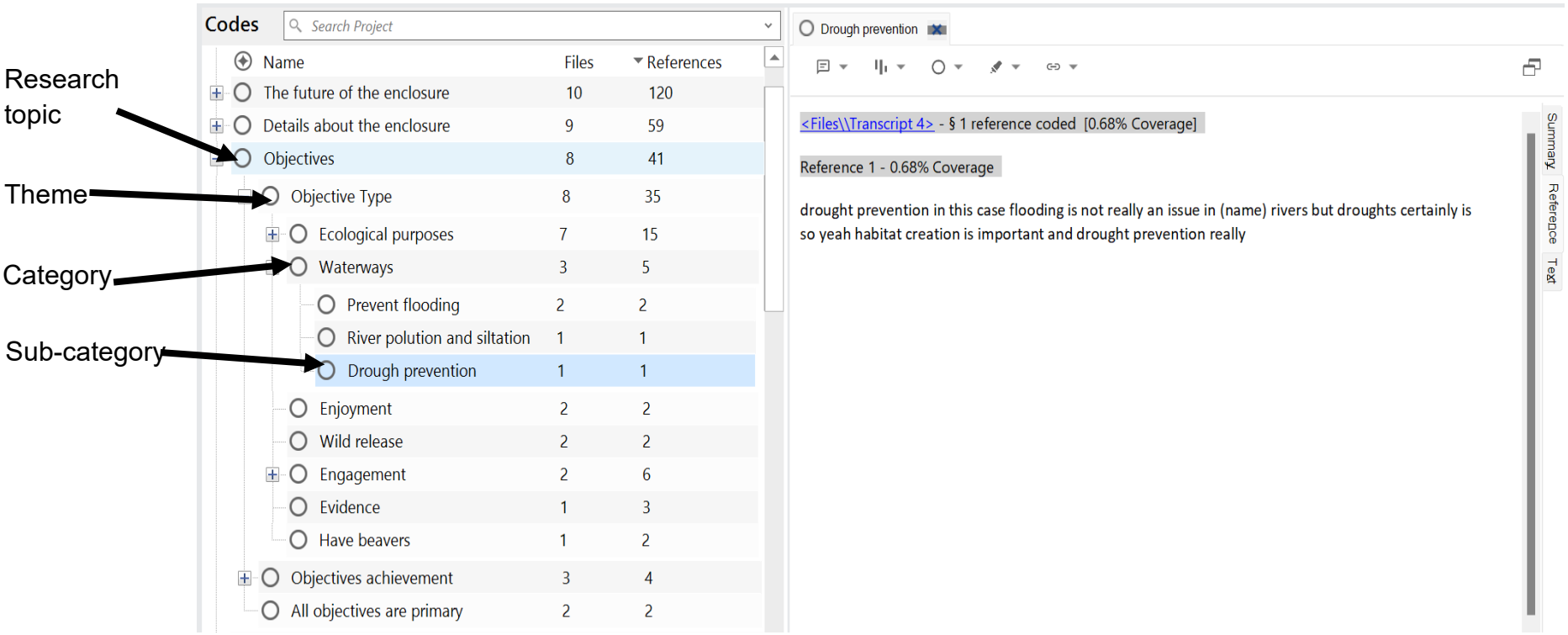

Figure 1: Screenshot of the interviews and qualitative survey data coded in NVivo. Files refer to the number of participants discussing the theme or category (online respondents are grouped in one file) and references refer to the number of times the theme or category was referred to across the interviews and surveys.

3. Results

The results are structured into five sections: beavers in enclosures, licensees' objectives for releasing beavers, monitoring and research, beaver activities, and the future of enclosures. There were three different types of data collection in this research, licensee's interviews, licensee's online surveys and beaver consultant interviews (Table 2). For each section in the results, it is highlighted which type of data the findings have been obtained from. Table 2 provides further guidance regarding the terminology used for the different types of data used in this report. The term interview or interviewees refers to the nine licensees interviewed and not the beaver consultants. When discussing the beaver consultant's interviews this will be specified.

Table 2: A table of the type of data collected, number of participants, subheadings used throughout this report and how to understand quotations.

Type of data collection	Number of participants	Subheading terminology	Understanding quotations
Licensee Interviewees	Four licensees participated in in-person interviews (did not do the questionnaire). Five licensees participated in online interviews (and also completed the questionnaire).	Licensee interviews	Use the term "Interviewee X" where X is a number. Interviewees 1 - 4 are the in-person interviewees. Interviewees 5 – 9 are the online interviewees who also completed the questionnaire.
Online survey	Fourteen licensees responded to the online questionnaire (5 of these respondents also did an online interview).	Online survey responses	Use the term "Survey respondent X" where X is a number.
Beaver consultant	Two independent beaver consultants participated in an interview.	Beaver consultant interviews	Use the term "Beaver consultant X" where X is a number.

3.1. Beavers, enclosures and licensing

3.1.1. Beavers in enclosures

Licensee interviews and online survey responses

Seventeen of the eighteen licensees participating in the interviews and online questionnaires have beavers currently living in licensed enclosures. The respondent that has no beavers currently in the enclosure stated that this was due to escapes and translocation away from the site. Within the seventeen enclosures, there is an average of 2.65 adult and sub-adult beavers (ranging from two to six), not including kits. Adults refer to the breeding pair, sub-adults are offspring from previous breeding seasons and kits are offspring from the current breeding season. Seventeen beavers were confirmed to have been born over the last four years in five enclosures, seven of which were born in 2022. There are at least eleven kits across five enclosures (seven born and four translocated with their family) although there may be more as participants were not specifically asked about translocated beaver families containing kits and some licensees had not yet confirmed the number of kits that had been born. The number of beavers present in the enclosures reflects beaver group sizes seen in the wild, which usually range between one and seven individuals (Campbell and others, 2005; Mayer, Zedrosser & Rosell, 2017).

Four participants reported the death of a beaver within the enclosure. Each had a different cause of death which were: (1) unknown, (2) poor health on arrival, (3) bacterial infection and (4) infected bite wound. Half of the enclosures (9) previously had beaver escapes with two enclosures currently trying to recapture their beavers. Although most participants stated they had recaptured their beavers, there were differences in licensees' experience regarding the ease of this. The reasons for escape included:

- pushing apart reinforced bars;
- grille dimensions;
- through badger gates/tunnels;
- badger damage to the fence;
- environmental damage to the fence and
- erosion of the water bank.

It should be noted that one escape was due to a trial of a new type of beaver enclosure. As this was unsuccessful the site built a secure enclosure and there have been no escapes since the beavers were introduced. Despite the previous escapes, 85.7% of the 14 questionnaire respondents said they were confident or very confident that their monitoring techniques could identify all the beavers present in their enclosure. Welfare monitoring (including the presence and absence of beavers) is further discussed in Section 3.3.: Monitoring and research.

3.1.2. Beavers: wild or captive?

Beaver consultant interviews

Interest in the status of beavers as wild or captive arose from the interviews with the two beaver consultants. When discussing beaver behaviour one beaver consultant stated that beavers:

> "…live their lives as wild beavers would without really bothering that much about the fences…" Beaver consultant 1.

On the other hand, the second beaver consultant did not think enclosures could replicate a beaver territory:

> "a strong issue for me is people do see these as wild animals and they're like oh naturalistic enclosures they're living wildly… I think that's one of my biggest frustrations really, reminding people these are captive, you know, whether you see them every day or not these are still captive animals therefore, no enclosure can ever truly replicate beaver territory…" Beaver consultant 2.

Due to the difference in opinion between the two beaver consultants, a question asking if beavers in licensed enclosures were considered wild or captive was incorporated into the licensee interview guide. This question was asked to the five licensees participating in the online interviews.

Licensee interviews

Five licensees participating in the online interviewees were asked if they viewed the beavers as captive or wild animals. Two of the licensees thought that the beavers were captive:

> "At the moment they're very much captive, I mean it's a wild creature that I hold within an enclosure…" Interviewee 5.

The third interviewee discussed that they were neither fully wild nor captive but somewhere in the middle due to the licensee's responsibility for the beaver. The final two interviewees perceived the beavers as wild due to their behaviour and lack of disturbance by people:

> "They're behaving very much like a wild population would… there's no public watching so they're very undisturbed, so they are wild" Interviewee 7.

This indicates that the status of beavers in enclosures as wild or captive is disputed among licensees.

3.1.3. The licensing process

Licensee interviews and online survey responses

Seventeen participants discussed the licensing process within the interviews and questionnaire. There was an overall positive response with 10 participants thinking that the procedure was easy or manageable and that Natural England is asking the right questions. Three survey respondents stated that they were unsure and four licensees had a negative experience of the licensing process. The challenges in getting a licence that was discussed included the long length of the application process, needing to apply for multiple licenses, the procedure being bureaucratic and complex and the short amount of time that the licence is granted before needing renewal (five years). There have been changes to the licensing process in 2022. Licensees no longer need to apply for three different licences, instead, there is a single unified licence. No licensees in this research had been through the updated licensing process.

Some of the licensees stated that a beaver consultant filled out the form on their behalf or helped them to complete it. One of the beaver consultants interviewed in this research echoed some of the licensee's negative perceptions, stating that the procedure was “complex” and “onerous”. In their opinion, this not only causes delays in releasing beavers in England but prevents the removal of beavers from the River Tay in Scotland which may lead to the shooting of a small founder population. Further evaluation is needed of the new licencing process, as applicants apply for the singular unified licence, to understand if the concerns discussed have been alleviated.

3.1.4. Financial constraints of beaver reintroductions

Licensee interviews

Constraints regarding the set-up and running of the beaver enclosures were not included in the interview guide or the survey. Despite this, five of the nine interviewees raised the issue of the financial burden of releasing beavers. Three interviewees stated the cost of their fencing which was upwards of £30,000, and one participant discussed that environmental assessments caused additional expenditure. The unaffordability of the fence was described as a limitation to both enclosure size and the number of enclosures. One interviewee who was part of a landowner-led rewilding group noted that there were members interested in supporting beaver reintroductions but because of financial constraints they are unable to build a secure enclosure. This interviewee reported that some of the members of the landowner-led rewilding group were willing to release beavers onto their land if wild releases were authorised.

Two of the interviewees stated that financial support should be supplied as beavers provide environmental benefits and services:

> "…it would be really nice to have some financial support… I'm providing a service for free which actually the state should pay for, like clean water, all the services they (beavers) do I've put the bill…" Interviewee 9.

On the other hand, two licensees discussed the financial help they gained through funding. This included local county-based grants and larger funding opportunities such as countryside stewardship schemes.

3.2. Licensees' objectives for releasing beavers into enclosures

3.2.1. Diversity and prevalence of objectives

Licensee interviews

The interrogation of the nine licensee's interviews identified seven key objectives they had for releasing beavers into enclosures (Figure 2):

- ecological benefits;
- benefits to waterways;
- advantages for engagement;
- personal enjoyment;
- pathway to wild release;
- advance knowledge and
- for the presence of beavers.

Interviewees did not exclusively discuss one objective for participating in beaver releases but referred to two or three themes. The themes 'ecological purposes', 'waterways' and 'engagement' are further split into multiple categories.

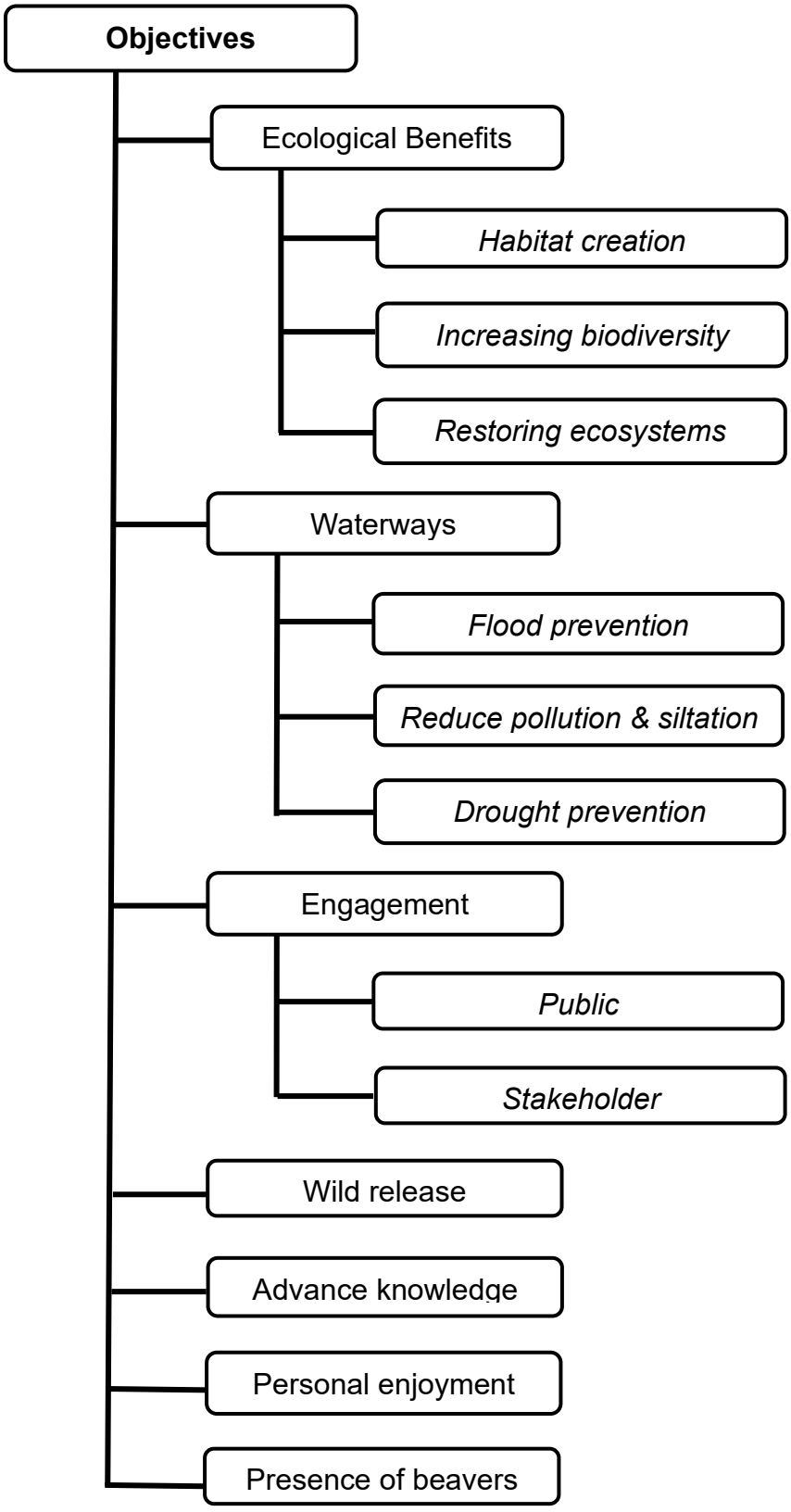

Figure 2: The objectives discussed by interviewees grouped into common themes.

Ecological benefits were defined as objectives that considered the physical and biological environment, excluding waterways. This theme was split into three categories (1) habitat creation, (2) restoring ecosystems and (3) biodiversity. Five interviewees discussed their ambition for beavers to create (wetland) habitats and increase habitat complexity. One licensee discussed their hopes that beavers would be able to create and maintain a wetland habitat beyond the capabilities of humans:

> "…prior to the beavers going in, it was a site that we worked on for years with volunteers and occasionally contractors to periodically coppice and to try and keep a nice wetland habitat going. But it was just beyond us really, it was just too much so the habitat point of view was the reason why I proposed it (the beaver enclosure)…" Interviewee 6.

A handful of interviewees discussed their objective to restore ecosystems. In all of these cases, the beaver enclosure was part of a wider rewilding project or mission to bring back natural processes to the land:

> "…they (the beavers) are in a rewilding project; it is like a missing part of the jigsaw for us you know. Talking about the megafauna that would have been here in the past, talking about the wild herbivores that would have been here in the past… Natural process that animals like beavers and other large herbivores that we have got here all contribute to this project…" Interviewee 1.

The third category, increasing biodiversity, was discussed generally by four licensees:

> "…the reason why we're doing this is we think this is a cheap and incredibly effective way of cultivating diversity, and the thing we're losing everywhere is biodiversity…" Interviewee 3.

Ecological benefits provided by beavers appear to be a common and important objective. Compared to the other objectives identified in the interviews, ecological benefits were talked about by the highest number of licensees.

The second theme **'waterways'** include all objectives related to rivers, streams and water retention on the land. This theme is comprised of three categories (1) flood prevention, (2) reducing pollution and siltation and (3) drought prevention. Two interviewees talked about flood prevention as an objective. In both cases, the interviewees stated that man-made flood prevention structures were too expensive and the beaver enclosure was considered as an alternative option:

> "…we were involved in a (funded project to reduce the river flow) and we put like 180 man-made wooden structures within the water courses… That started in 2009 and then when that project came to an end there was no funding to maintain those structures going forward. So, the main aim of the trial was to see if the beavers would adopt and maintain those structures on our behalf or whether they'd build

> their own structures that did the same equivalent job of slowing the flow…" Interviewee 7.

The second and third categories in the theme 'waterways' were both discussed by one interviewee who was employed by a river conservation charity. They hoped that the introduced beavers would help manage phosphate pollution and siltation, as well as prevent drought.

Two forms of **engagement** were identified, engagement with the public and engagement with stakeholders. Public and stakeholder engagement were both discussed by two interviewees. Licensees did not expand on what public engagement they aimed to provide. When talking about their motivation for stakeholder engagement the interviewees discussed their enclosures as demonstration sites where stakeholders (such as farmers, landowners and conservation non-governmental organisations) could come to their site, look at what beavers do and provide education:

> "…we are prepared to be a test case and do the not always comfortable political work with our neighbours exposing ourselves saying come and see what we're doing come and have a look come and see this because we need to learn how to manage this but you need to embrace it…" Interviewee 3.

Activities relating to engagement are not examined within this report. Further research should assess what engagement is currently being conducted in beaver enclosures and how this can help mitigate potential conflicts and provide education.

The final four themes, **'wild release', 'advance knowledge', 'personal enjoyment'** and **'presence of beavers'**, were all talked about by one or two interviewees. Although the initial objective of having wild releases was only discussed by two interviewees, there is support for beavers to be released into the wild in the future (Section 3.5). It is expected that either wild releases were an initial objective that interviewees overlooked or the motivation to release beavers into the wild has grown after seeing the benefits they can bring. One interviewee said that collecting scientific evidence on the effect of beavers in the local area was important. Although they did acknowledge that there is much already known about beavers, an opinion that is echoed by other licensees. Despite this objective appearing less popular than others, many sites are participating in research that has the potential to be published (Section 3.3). The final two objectives, enjoyment and presence of beavers, were interlinked:

> "…this is a passion project, it's not an official project, we're not an NGO, it's total passion. It's to do with loving wildlife and loving beavers so we don't have real objectives apart from giving beavers a place to live… their (the beaver's) objective (is to) transform the whole area into something that is much more alive, there is many more animals, much more biodiversity… so that's the objective, the object is to create a space where beavers… can really expand and do their thing and for us to enjoy it." Interviewee 9.

Here the interviewee described wanting to make space for beavers because of their love of wildlife and the enjoyment they gain from the project.

Online survey responses

When asked to select their objectives for releasing beavers into an enclosure from a pre-determined list, survey respondents chose an average of 6 categories (range: 4 – 9). One respondent selected the objectives ‘improving water quality’, ‘help restore natural processes’, ‘improve habitat’, ‘beavers present in the area’, ‘improve biodiversity’, ‘education and awareness’ and ‘other’ as both primary and secondary objectives. These answers have all been coded as primary outcomes for this report. Seventy-one percent of the objectives were identified as primary and 29% of objectives were secondary. The most popular objectives were ‘help restore natural processes’ and ‘improve biodiversity’, and the least popular objective was ‘tourism and visitor attraction’ (Figure 3). Interestingly, increasing water quality was identified as a secondary objective more frequently than a primary objective. Two respondents chose the category ‘other’. They stated their objectives as (1) engaging landowners and (2) rescuing beavers from being shot.

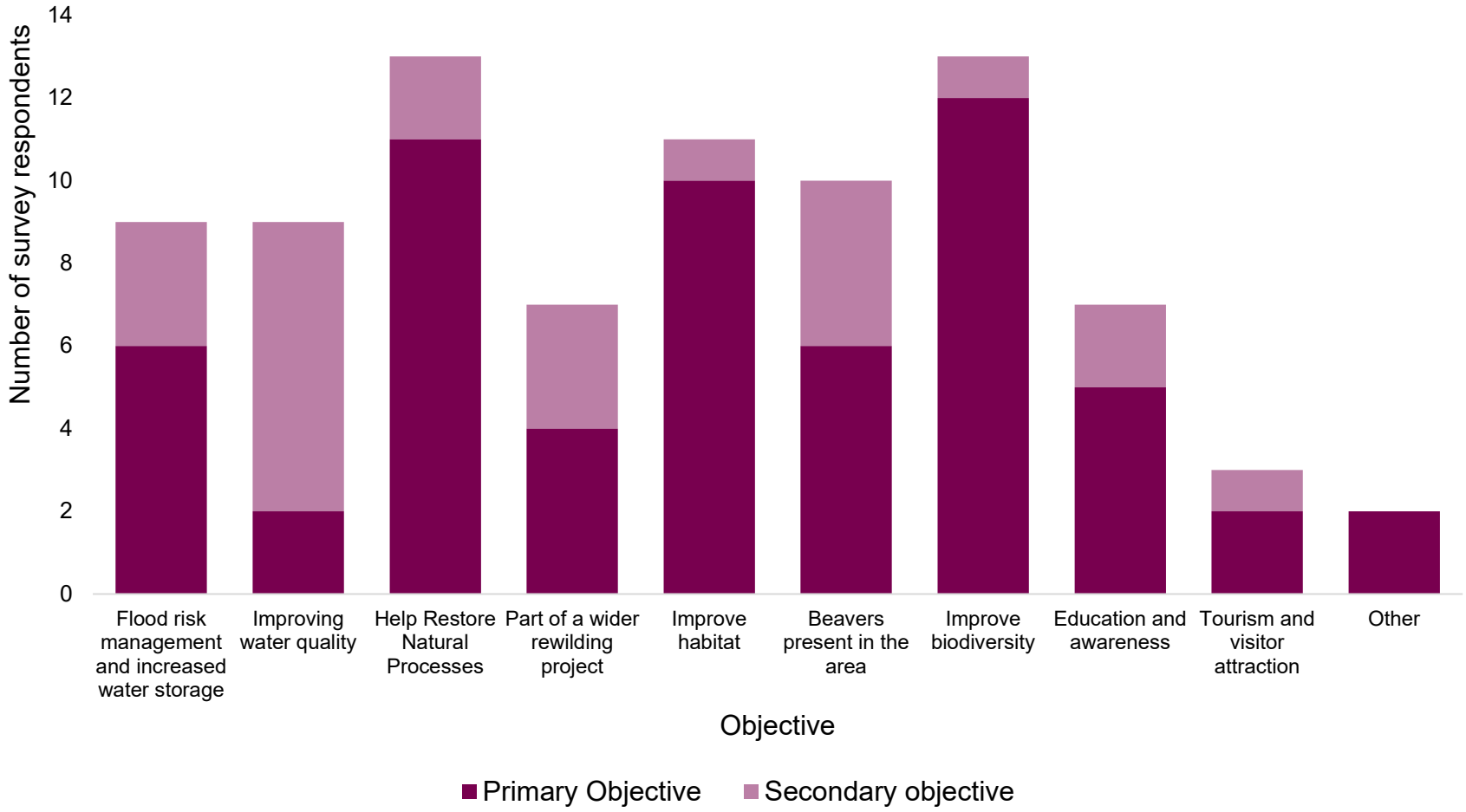

Figure 3: The primary and secondary objectives licensees had for releasing beavers into an enclosure.

3.2.2. Achievement and monitoring of the objectives

Online survey responses

Licensees participating in the online survey were asked if each of their objectives had been achieved and if monitoring was ongoing. Respondents indicated 87% of objectives are being monitored for and 68% of the objectives have been achieved (Table 3). From the comments provided by survey respondents who selected the category ‘unsure’, it appears that they are monitoring but unsure if their objectives are yet to be achieved. The survey respondents were asked if any constraints were impacting their abilities to achieve their objectives. Restrictions to achieving objectives included a longer time needed for data collection and managing beaver escapes. However, the lack of beavers was not always a barrier as one respondent wrote that despite there being no beavers present, successful beaver education continued. Another respondent wrote that Natural England had not made achieving their objectives easy. They were asked to expand on this in an interview and they discussed that the reintroduction of beavers was too slow and faster action is needed to help the environment.

Table 3 displays the number of survey respondents who indicated if they had a specific objective and their answers to whether that objective is been monitored for and achieved. For some objectives, the number of licensees stating that they had that objective was lower than the number of licensees indicating their monitoring or achievement status of the objective. For example, in Table 3, thirteen licensees reported that restoring natural processes was a primary or secondary objective, however, fourteen respondents discussed the current monitoring and achievement status of restoring natural processes. For the category ‘tourism and visitor attraction’ one respondent did not select that this was an objective but did indicate that ‘the objective has been achieved and no monitoring is occurring at this time’. The respondent may have overlooked selecting the objective ‘tourism and visitor attraction’ or this may not have been an objective but an outcome of the beaver release. The other inconsistencies in Table 3 are because one respondent indicated that the predetermined objectives had been monitored or achieved but did not identify these statements as primary or secondary objectives that they hold for releasing beavers. It is expected that the licensee misunderstood this question and overlooked selecting the statements as a primary or secondary objective.

Table 3: Licensees' responses to the online survey question asking respondents to indicate their objectives for releasing beavers from a predetermined list. This table also includes the number of licensees who are currently monitoring the objective and the number of licensees that have achieved the objective.

Objective	Number of licensees who indicated that this was an objective for releasing beavers	The objective has been achieved and monitoring has continued	The objective has been achieved and no monitoring is occurring at this time	The objective has not been achieved and monitoring is ongoing	The objective has not been achieved and no monitoring is occurring at this time	Unsure
Flood risk management and increased water storage	9	5	1	2	0	1
Improving water quality	9	1	2	3	0	4
Help restore natural processes	13	11	0	3	0	0
Part of a wider rewilding project	7	5	1	1	0	0

Objective	Number of licensees who indicated that this was an objective for releasing beavers	The objective has been achieved and monitoring has continued	The objective has been achieved and no monitoring is occurring at this time	The objective has not been achieved and monitoring is ongoing	The objective has not been achieved and no monitoring is occurring at this time	Unsure
Improve habitat	11	9	0	3	0	0
Beavers present in the area	10	9	0	2	0	0
Improve biodiversity	13	10	0	4	0	0
Education and awareness	7	4	1	3	0	0
Tourism and visitor attraction	3	1	1	2	0	0
Other	2	1	0	0	1	0
Total	84	**56**	**6**	**23**	**1**	**5**

3.3 Monitoring and research

Licensee interviews

Interviewees were asked if there was any difference between monitoring and research. Three interviewees thought there was a difference – scientific research was described as data-driven and followed set methods whereas monitoring was more flexible. Although perceived as different there was also much overlap between monitoring and research. One interviewee stated that although not all monitoring can be used as research, all research can be used as monitoring:

> "I'd say it's all monitoring, some of it is done sort of more scientifically so it would be able to be peer-reviewed and put in a paper and whereas some of it isn't quite as scientifically backed…" Interviewee 7.

This is supported by a fourth interviewee who stated that although monitoring and research are different, their site grouped all the research activities undertaken as monitoring. To fully capture and comprehend monitoring that is occurring at the sites, research and monitoring techniques will be discussed together within this section.

3.3.1 Why monitor?

Beaver consultant interviews and licensee interviews

Beaver consultants and licensees were asked why they conducted monitoring during the interviews. The beaver consultants stated that monitoring should be done (and is done) for beaver welfare, licensing requirements, objectives and engagement purposes. These answers are mirrored in the licensees' reasons to monitor which include:

- beaver welfare;
- objectives;
- enjoyment;
- licence requirements;
- engagement purposes (public and stakeholders);
- advanced knowledge;
- self-motivation and
- advise on wild releases.

There were some discrepancies regarding the category 'licence requirements'. Two interviewees (a beaver consultant and a licensee) saw monitoring as part of the licence requirement. In comparison, two interviewees (one beaver consultant and one licensee) did not think monitoring was a requirement for the licence. A third licensee stated that most of the monitoring they do is beyond the requirements of the licence.

3.3.2. Monitoring and research activities

Licensee interviews and online survey responses

A large variety of monitoring and research activities were described by the participants taking part in the interviews and the survey. Monitoring efforts are site-based; many licensees reported doing a large amount of monitoring whilst others conducted fewer monitoring activities. The monitoring occurring at enclosures included:

- wildlife monitoring;
- beaver behaviour and welfare;
- habitat and vegetation monitoring;
- hydrology monitoring;
- water quality monitoring;
- fence line monitoring and
- engagement and social monitoring.

Interview and survey participants conducting wildlife monitoring reported a large number of flora and fauna currently or previously being surveyed within the enclosures (Figure 4). Birds and bats were the most commonly monitored, followed by vegetation and invertebrates. Other habitat monitoring included landscape changes, including the watercourse and the structures beavers build. Interviewees monitoring hydrology talked about water flow and those monitoring water quality considered pH and carbon cycling.

Figure 4: A word cloud showing the monitoring of the different types of flora and fauna in beaver enclosures. The larger the word the more participants discussed monitoring that taxonomic group. Birds and bats (highlighted in red) were talked about the most frequently.

Ten licensees participating in an interview or online survey stated that they were willing to share research and monitoring data with Natural England. Two participants indicated that they were not willing to share data. One interviewee raised the issue that they did not know what data would be useful for Natural England. This highlights an opportunity for collaboration between licensees and Natural England although there would be a need for Natural England to provide direction on the data that they require.

Online survey responses

To understand the frequency in which monitoring activities were conducted, fourteen online survey respondents were asked to select the monitoring techniques used at their site from a predetermined list (Figure 5). All survey participants selected the category ‘direct observation’ as a monitoring technique they used. Other popular monitoring techniques included baseline environmental data, field sign surveys, environmental parameter surveys and drone monitoring. Fewer licensees used the methods eDNA

analysis and monitoring of public perceptions. For each monitoring type, fewer respondents stated that monitoring helped them achieve their objectives compared to the number of licensees using the monitoring technique. This is not surprising as in the interviews, participants gave eight reasons for monitoring of which objectives are one (see Section 3.3.1. Why monitor).

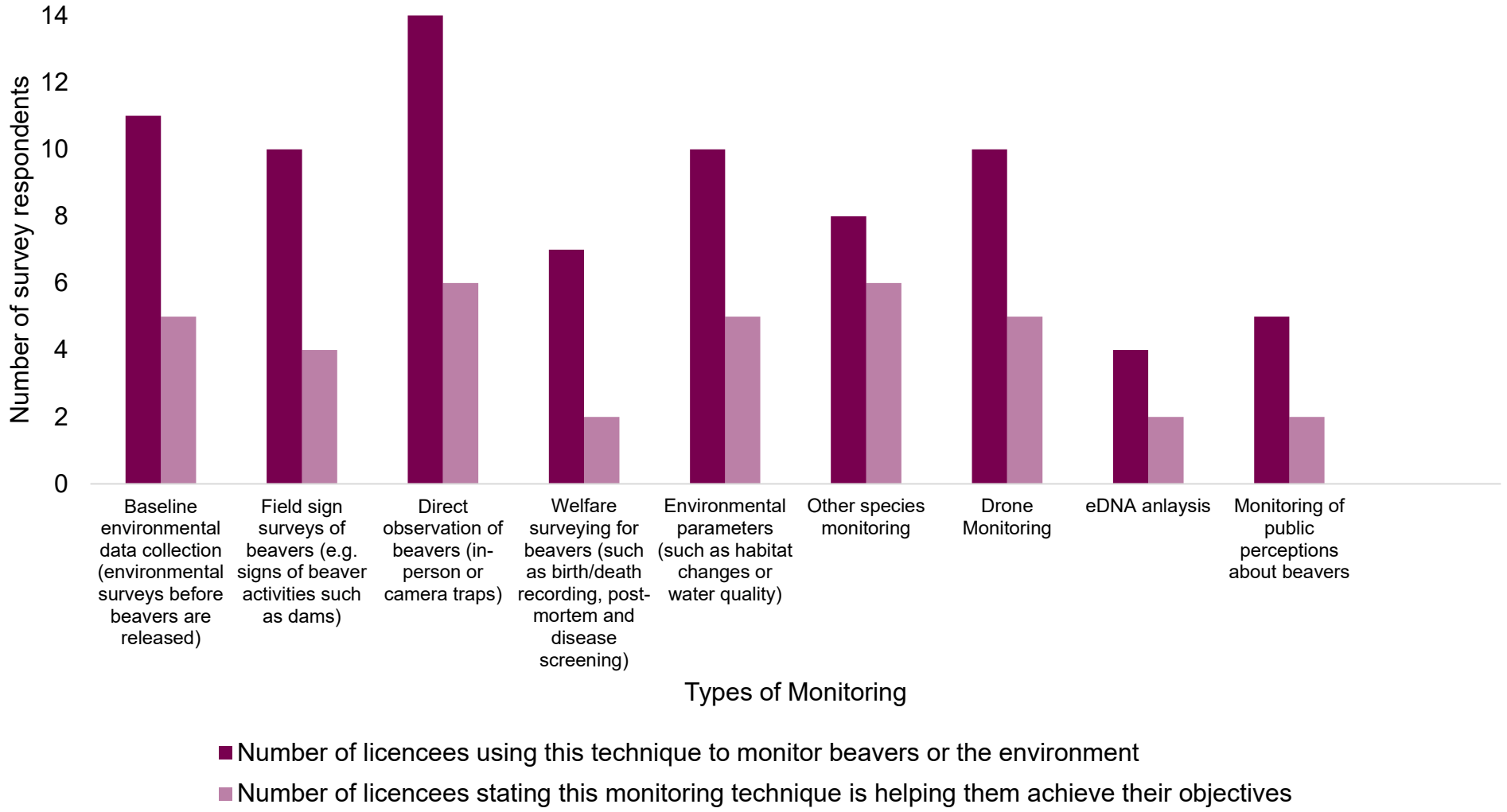

Figure 5: The monitoring techniques that online survey respondents indicated they used from nine pre-determined categories and their view regarding if the monitoring technique has helped them achieve their objectives.

3.3.3. Monitoring Techniques

Licensee interviews and online survey responses

The interviewees and survey respondents highlighted 20 techniques they used to conduct monitoring and research (Figure 6). Camera traps and personal observation were discussed the most frequently, with camera traps talked about by almost all participants. Both techniques were commonly used to monitor beaver behaviour and welfare. The participants considered many different surveys for wildlife although did not often expand on what this entailed, although transects were a common method used at some sites. Other techniques discussed by multiple participants included fixed-point photography, drones (photography and lidar), photography and flow devices. University students and volunteers were often involved in monitoring, which included popular citizen science projects including Riverfly[2] and the breeding bird survey[3].

Figure 6: A word cloud showing the monitoring techniques used by licensees. The larger the word the more participants discussed that monitoring technique. Camera traps and observations (highlighted in red) were discussed the most by participants.

[2] riverflies.org/
[3] bto.org/our-science/projects/breeding-bird-survey

3.3.4. Constraints to monitoring

Licensee interviews

Interviewees identified several constraints to the monitoring techniques they used. First, two licensees discussed that research or monitoring is often conducted by students and volunteers. When these individuals leave the project, the monitoring is not necessarily able to continue. Another theme relating to students and volunteers is their recruitment. Three interviewees stated that they were happy for people to conduct research or monitoring at their site, but they are not actively looking for potential partners:

> "…we haven't actively gone out to partner with anyone, we have just been accepting anyone that comes to us, like if you know anyone send them to us…" Interviewee 3.

Therefore, there is an excellent potential for collaboration in the future between scientists, students, volunteers, and licensees.

Some of the beaver activities were also identified as a hindrance to monitoring by a handful of interviewees. For example, beavers grooming out their ear tags make them difficult to be recognised. One interviewee provided an account of beavers moving research equipment being used to assess algae growth:

> "…for the algae growth, you get bricks and these students applied terracotta-type tiles to glue onto the bricks for the algae to grow on and you put the bricks in the water at various points across the control site and by the dams. So, the ones we put in by the beaver dam… I went to go back and get them, could not find them anywhere and the main beaver pool now is really deep and we spent about an hour trying to get them… then a week later I was checking all the cameras on the site and I went down to the next dam down and the beavers have put them (the tiles) on the next dam down… so yeah monitoring doesn't always work with the beavers." Interviewee 6.

Other obstacles to monitoring identified by interviewees included the financial barriers, including waiting for funding and contractors being too expensive, needing to decide how to measure objectives (this project had just released beavers), and needing more support. Licensees already doing a lot of monitoring stated that much was already known about the benefits of beavers and they did not want to "reinvent the wheel" for research already conducted. The one licensee who said they would like more support did not have a background in ecology. They had gone to the beaver consultants when needed and discussed in the interview how they had become better at reading the signs of the beavers. This request for additional support does not appear to be from a source of worry that they cannot monitor beavers, rather it may be helpful for licensees to be provided with

more information regarding different monitoring techniques and/or how to conduct monitoring more effectively.

3.3.5. Welfare Monitoring

Beaver consultant interviews

The importance of welfare monitoring was emphasised by beaver consultant 2 and was a common theme throughout their interview. They stated that there was not enough focus placed on beavers in licensed enclosures being captive animals (see Section 3.1.2.) and the laws surrounding captivity:

> "…again this is my frustration because captive animal I mean under the law you have to monitor it… I feel there's a legal requirement (to monitor beavers) because they're captive and I feel that's something that's not really either enforced, or encouraged, or required like there's no real demonstration of that…" Beaver consultant 2.

In both the beaver consultant interviews, it was stated that welfare monitoring should assess body condition (injuries, body weight, tail scars, fur condition), population monitoring (number of individuals, births and deaths), post-mortems and beaver behaviour.

Licensee interviews

Questions specifically targeting welfare monitoring were only incorporated into the interviews after the conversations with the beaver consultants. Therefore, only five interviewees were specifically questioned about the welfare monitoring they conducted, although some of the earlier interviewees also commented on this topic. This section will provide initial perceptions; however, it is advised more information is collected regarding welfare checking during Natural England compliance checks.

Three interviewees specifically stated that they thought the beavers looked happy and healthy. The interviewees appear to be very protective of the beavers, one licensee specifically stated the responsibility they had to the beavers:

> "…we have to take their welfare very very seriously because we are responsible for them…" Interviewee 6.

Camera traps and direct observations are most commonly used to measure behaviour and body condition. However, whether welfare monitoring is conducted systematically at every enclosure was beyond the scope of this research.

One issue discussed by the interviewees was the difficulty in telling apart the beavers, which in some cases was described as impossible. Ear tags were said to get groomed out

and beavers were not captured together on the camera traps. No solution was provided to help tell apart individual beavers. This poses an issue for confirming all the beavers are present in the enclosure as well as ensuring the body condition and behaviour of each beaver have been monitored. Therefore, when providing guidance for welfare monitoring, the constraints of monitoring must be considered (Section 3.3.4.):

> "…you don't quite realise when you're writing your licence form and you say we're going to trap and monitor the beavers every year and sort of tag the offspring within a year of being born. Trapping the beavers is actually quite difficult especially when you've got quite a few beavers in there…" Interviewee 7.

Further advice regarding welfare monitoring is provided in Section 4.3.4.

3.4. Beaver activities

Box 1. Licensee interviews

Box 1: Beaver behaviours observed by interviewees. Potential stress behaviours are marked with an asterisk (*).			
Building and maintaining dams	Creating channels and canals	Building and maintaining lodges	Interacting with other animals
Feeding	Felling trees	Locomotion	Chewing
Interactions between breeding pair	Grooming self	Planting	Play
Teaching young	Teeth sharpening	Tree climbing	Territorial behaviour
Food caching	Tail slapping	Aggression*	Trying to escape*
Spending time alone*	Pacing fence line*	Testing the fence (including digging)*	Left blank

Twenty-three beaver behaviours were discussed by interviewees (Box 1). Data-derived names were attempted to be used as much as possible for the behaviours, meaning the name of the behaviour comes from the interviewees' descriptions. However, when this was

not possible the names were research-derived, meaning the researcher chose a suitable name for the behaviour.

Three interviewees specifically stated that they thought that the beavers were relaxed:

> "…when we have sat down to watch them they have been pretty cool with us being there. We haven't had any kind of, well not much tail slapping and we kind of just get them cruising past looking at us and they do little circuits, they're quite chilled out." Interviewee 1.

The interviewees witnessed and noted many positive behaviours, the most frequently discussed behaviours were dam building/maintenance, creating channels and canals, eating, and building/maintaining lodges. Interviewees also discussed behaviours that they had not expected:

> "…so I don't think they have done anything unusual except the tree climbing…" Interviewee 4.

Seven interviewees identified five potential stress behaviours shown by beavers; three of these licensees talked about abnormal behaviours they knew of at other sites but said they were not present at their enclosure. Three licensees witnessed beavers in their own enclosure pacing, two talked about the beavers testing the fence and one interviewee identified that beavers tried to escape. Some licensees identified potential reasons for these behaviours. One interviewee talked about how pacing behaviours occurred after an escaped beaver had been recaptured and another licensee identified that the pacing behaviour occurred because the sub-adults wanted to disperse:

> "…last spring when they (the beavers) were two years old there was a bit of footage of them looking at the grill and then walking up the fence a bit and walking back down. So they were obviously ready to disperse and trying to get out but couldn't and I was quite sad about that. But then after about two weeks, they stopped that behaviour and we got footage of them again with the adult so they obviously tried to get out, realised they couldn't but then still were accepted back to the family unit, so it wasn't like they were being kicked out…" Interviewee 7.

Aggression was talked about by one interviewee who stated that they knew of an enclosure, not their own, where a beaver became aggressive due to translocation. They did not say if this aggression continued following release.

Online survey responses

The 14 online survey respondents were asked to identify which beaver behaviours they had observed and which they monitor from a predetermined list. As the online survey was run alongside the interviews the list of behaviours provided was obtained from the academic literature and not the interviews – although there is a substantial similarity. Most

beaver behaviours are not being monitored (Figure 7). Therefore, it is difficult to assess the prevalence of behaviours across the enclosures. The signs of the behaviours that are frequently identified (such as dam building) are often obvious. The behaviours that were less commonly identified by licensees (such as territorial behaviour) may still play a large part in the beaver's activity budget but the signs of these behaviours may be difficult to observe.

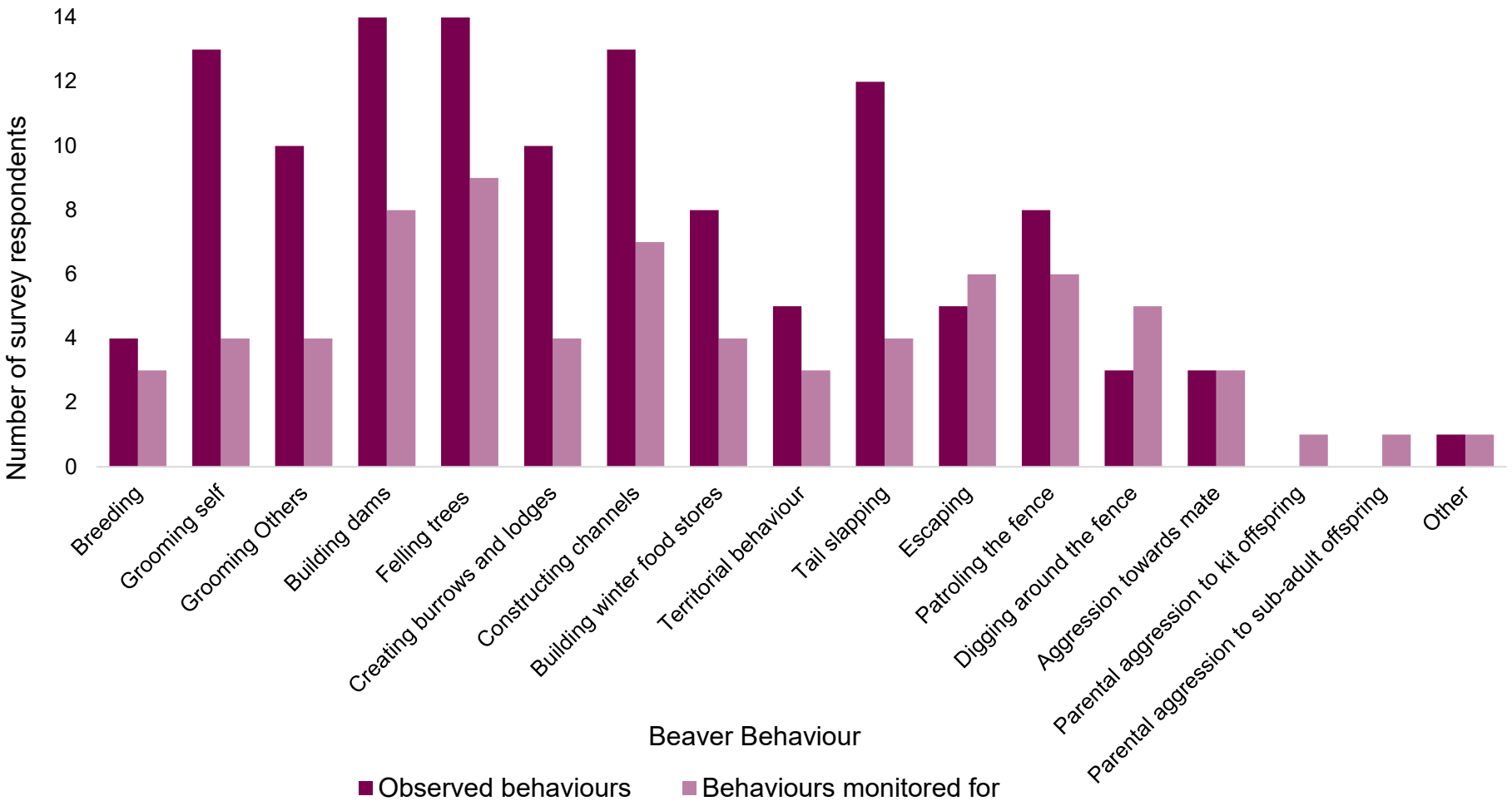

Figure 7: Online survey responses showing the comparison of recorded beaver behaviours against behaviours monitored for.

3.4.1. Artificial structures

Licensee interviews and online survey responses

Picture 1: A beaver lodge created by a licensee © Catherine Wilson

Artificial structures are man-made objects (or modifications) added to the beaver enclosure, with the intention of improving the beaver habitat (such as providing safe spaces). Of the eighteen licensees participating in this research (all of whom were from different sites), fifteen had installed artificial structures before the beaver release and three had not. The most frequently added artificial structures/modifications were lodges, dams, and beaver ponds, with thirteen licensees adding these structures/modifications.

Ten licensees built lodges before beavers were introduced, with eight people stating they had been used. Seven participants discussed how long the beavers used the lodge; three licensees said the beavers had used the lodge for 2 – 7 days, two said they had been used for 6 months and one licensee witnessed beavers using the lodge for a year. In one case, an interviewee said the lodge was still being used (beavers have been in the enclosure for 9 months). One licensee was unsure if the artificial lodge had been used. The respondent who had a lodge that had never been used thought that this was because the lodge had been built too high above the water. The final participant did not say if the lodge had been used.

Six participants had built a dam, a set of dams or a structure to act as a dam foundation or support. All six licensees discussed at least one of their structures had been used by the beavers:

> "…we put in a couple of slats and posts just to hold the water in and that would have blown out if it wasn't for them (the beavers). 'Cause, as soon as they could get out from where we had put them within two hours they were already adding to that dam…" Interviewee 1.

Seven participants created or deepened ponds, five of which are being used, one is abandoned. Finally, two participants discussed the addition of other structures: a diverted dyke and an unspecified structure. The unspecified structure was not used but the dyke was.

3.5. The future of the enclosures

3.5.1. Licensees' plans and motivations

Online survey responses

The fourteen licensees participating in the online survey were asked what their plans were when their current licence ends. Six respondents wanted to request to release beavers into the wild, six were going to request to extend the current licence and two were unsure. No respondents indicated that they were not planning on renewing the licence. Of the six survey respondents that stated that they wished to extend the current licence, two expected to continue running the enclosure for 1 – 5 years, one for 11 – 15 years and three in perpetuity. One survey respondent who stated they wished to run the enclosure for another 1 – 5 years was interviewed and asked to further explain this choice. They stated that they would review the success of the enclosure within 1 – 5 years and decide then whether to continue with the project. They also mentioned that they were not in charge of the site and that the managers would be making the decision regarding releasing beavers into the wild if it became an option. One respondent who said they were unsure about their plan for licence renewal was asked why this was the case, they stated that they were:

> "Waiting on the DEFRA/ NE national strategy on wild living beavers". Survey respondent 6.

This reflects the answer provided by one of the interviewees.

Licensee interviews

The four in-person interviewees who did not participate in the online surveys were asked what their plans were when their current licence ended. Three interviewees wished to request a wild release and one interviewee stated that it depended on the outcome of the DEFRA consultation[4].

[4] https://www.gov.uk/government/consultations/beaver-reintroduction-and-management-in-england/outcome/summary-of-responses-and-next-steps

> "…we would love to carry on having beavers here, but it really depends on what comes out of the Defra consultation about whether we can have beavers here long term, if we can take down the pen…" Interviewee 1.

Two licensees stated that if they did a wild release they would be interested in putting up fences across some water features as a barrier to prevent beavers from leaving the wider site and entering areas of potential conflict.

3.5.2. Motivations for the future of the enclosures

Licensee interviews and online survey responses

Interviewees and online survey respondents were asked about their motivations to either request an enclosure licence renewal or apply for a wild release, if allowed (Figures 9a and 9b). The most frequently discussed motives of both groups (wild release and extending enclosure license) were similar. Both groups were motivated by ecological benefits and the values provided to the waterways[5]. This included creating habitat, reducing flooding and other environmental benefits:

> "Because beavers are a primary driver of nature recovery and should be released at a landscape scale and not kept in enclosures" Survey respondent 6.

> "To enable the species to continue to bring the benefits we see when beavers are allowed to return." Survey respondent 13.

In these two examples, the survey respondents discuss environmental benefits that motivate them in their plans for the enclosure. Although the benefits discussed by the respondents are similar, survey respondent 6 would like a wild release and survey respondent 13 would like to extend their enclosure licence. A similar pattern is found when looking at the benefits for waterways:

> "…beavers are a huge solution their life bringers they make wetlands they prevent droughts, you can see it, and they help with flood mitigation…" Interviewee 9.

> "…continue to hold water on the site to help reduce the flows to the village downstream." Survey respondent 8.

[5] 'Ecological benefits' were defined as motivations that considered the physical and biological environment, excluding waterways. The motivation 'waterways' include all motives related to rivers, streams and water retention on the land.

Interviewee 9 wishes to release beavers into the wild and survey respondent 8 wants to continue the licensed beaver enclosure. However, both are motivated by the benefits that beavers bring to flood mitigation. There were some differences in motivations relating to ecological and waterway benefits; participants wanting wild releases identified a higher number of motivations compared to those wishing to continue the beaver enclosures.

Further differences in motivations were found between the licensees wanting to extend the enclosure licence and those intending to request a wild release. The licensees who wished to continue the enclosure had fewer motivations compared to those participants who hoped for a wild release. They were motivated by the continuation of their environmental program, to keep beavers on their site and to see what happens at other free-release sites (Figure 9a):

> "…at the moment the bosses are supportive of keeping them in a fence and if depending on what happens with free-roaming beavers, you know, look at other areas of free-roaming beavers" Interviewee 6.

In comparison, the licensees who wanted a wild release were motivated by wanting beavers to disperse into the landscape, for personal reasons, had a lot more area they wanted the beaver to impact, thought beavers should be wild and the beavers are already escaping (Figure 9b). Personal reasons stemmed from the participant's love for the environment and wanting to live alongside nature. Three participants further discussed that they thought the beavers were likely to be committed to their release site as they have formed a territory in that enclosure:

> "…my hope is that keeping them where they are in an enclosure means that when we do remove the fencing they will feel comfortable in the environment that they're in and they won't actually want to roam far from that. Obviously, their offspring in the future might…" Interviewee 7.

Although there are apparent differences between the motivations of licensees who want wild releases compared to those wanting to extend the enclosure licence, for those motivations which were the most prevalent there are a lot of similarities.

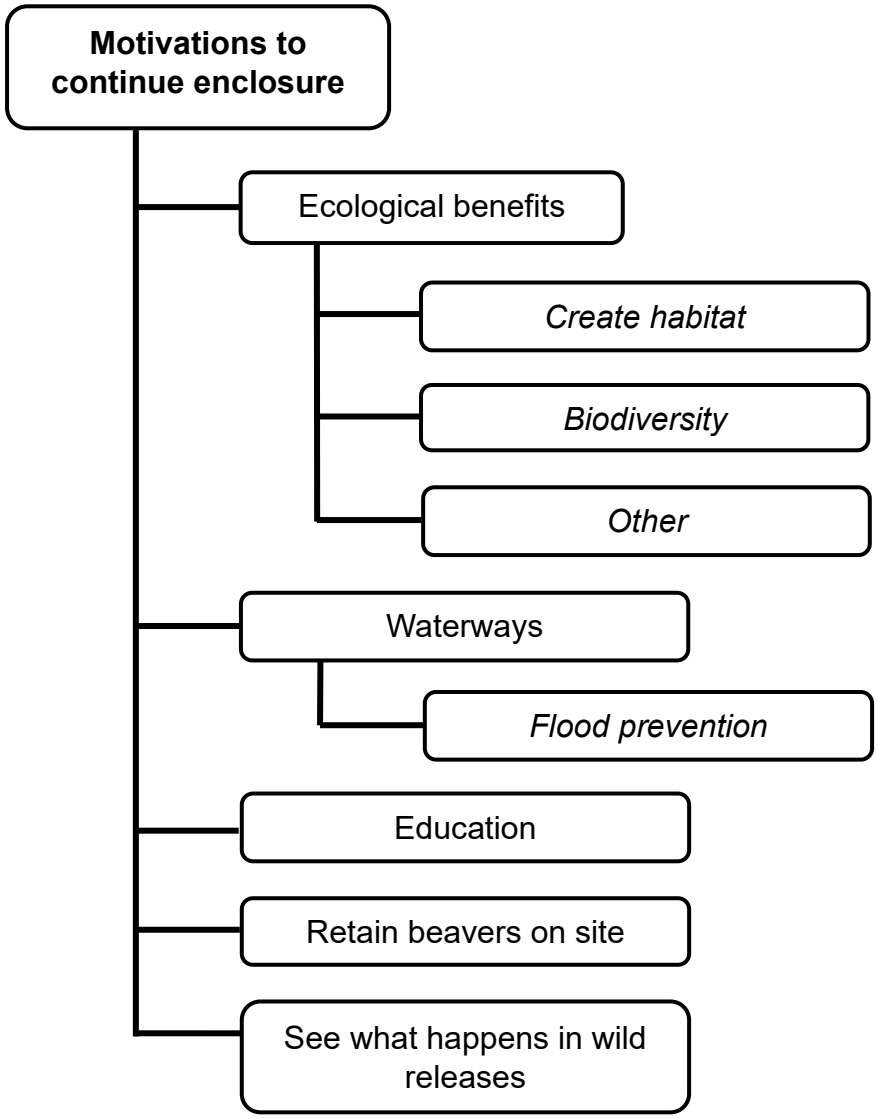

Figure 9a: Licensees' motivations for continuing the beaver enclosure project.

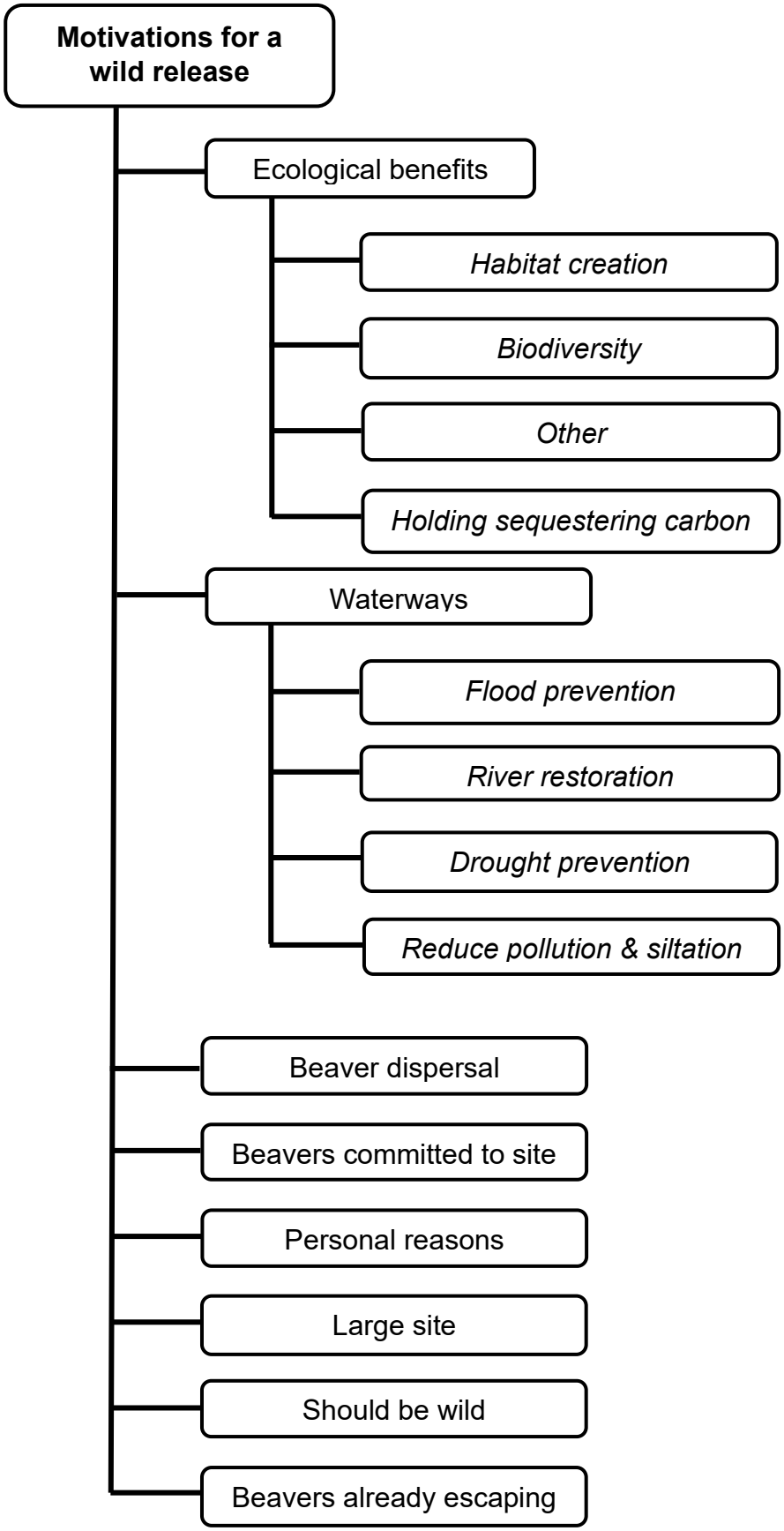

Figure 9b: Licensees' motivations for wanting wild releases of beavers.

3.5.3. Considerations needed for wild releases

Licensee interviews

Nine of the licensees in this research were hoping for wild releases, either before or after their current licence had ended. However, six interviewees did consider steps that were needed for wild releases to be successful and reduce potential conflict. These measures included:

- need to collaborate;
- employment of beaver officers;
- training and education and
- funding.

Five interviewees discussed the importance of collaboration between themselves and stakeholders, the public, Natural England and potential partners (eg, charities):

> "…it shouldn't be them and us saying we have released beavers everyone else can deal with the consequences. It's got to be a collaboration where we are embracing having beavers back in the landscape, supporting landowners and farmers that need help…" Interviewee 1.

One interviewee discussed that there was a conflict of interest between the licensees and Natural England (specifically the policy surrounding beaver reintroductions). They also stated that there should be more recognition and appreciation for the licensees who have contributed resources and time to help the reintroduction of beavers to England.

Four interviewees talked about the benefits that having beaver officers would bring to the potential reintroduction of beavers into the wild:

> "…I am sure it's not simple but I feel like it's a bit of a no-brainer that the cost of an officer would be far outweighed by the benefits that are brought overall…" Interviewee 1.

They discussed that a beaver officer could assist in advising on how to protect land, relocate beavers, mitigate against beaver activities, and know the abundance and dispersal of the beavers across the county or England. Two licensees thought that people needed to be trained and educated. The first interviewee believed that people needed to be taught how to combat beaver activities on their own, such as videos to show people how to build tree cages to protect their trees. They followed this up by stating there was a need for funding to allow mitigation to be freely available. The second licensee thought there needed to be more education about the benefit of beavers. In a nationwide survey in Great Britain addressing stakeholder's perceptions, it was found that people with a strong knowledge of beavers are more likely to view them positively highlighting the need to address education and misinformation (Auster, Puttock & Brazier, 2020).

3.5.4. The dispersal of sub-adult offspring

Beaver consultant interviews and licensee interviews

One of the beaver consultants stated that offspring did not always need to be translocated when they reach dispersal age, usually between one and three years old (Mayer, Zedrosser & Rosell, 2017). Beavers will delay dispersal if there is nowhere for them to go and will continue to remain in their family group. The beaver consultant stressed the importance of monitoring the beaver's behaviour and body condition as this will indicate when the beaver needs to be translocated. They emphasised that beavers who do not need to be rehomed should stay in the enclosure. This is because the number of kits they expect to be born far outweighs the number of enclosures they predict will be built in the future. Therefore, each individual should be considered on a case-by-case basis depending on the condition of the beaver and the resources in the enclosure.

In interviews, licensees were asked what they would like to happen to their sub-adults if they needed translocating. There appears to be a lot of uncertainty regarding what would happen to the beavers, although much of this stems from the licensees not knowing if there will be wild releases in the future. Five participants said that they would take their advice from either Natural England or one of the beaver consultants:

> "…I don't know we will just take our advice from (beaver consultant names) you know whatever they think is best. It's about keeping in touch with them constantly, keeping them updated with what's going on…" Interviewee 2.

Eight licensees discussed the possibility of sending their beavers to another enclosure, five interviewees talked about the option of wild releases and two participants stated that the enclosure was large and they expected that the beavers could stay. Many of these licensees discussed two or three potential options:

> "There is enough space for any young within the enclosure for some time. We do hope to capture and relocate individuals when that isn't the case, to other projects in (English county) or further afield. We also hope to have wild releases in (English county) in the near future." Survey respondent 1.

One concern that two of the interviewees discussed was ensuring that there is a genetically diverse population of beavers in England. One interviewee insinuated that the beavers had to be moved between enclosures to maintain genetic diversity. Another interviewee said:

> "…what we need to have, and the Beaver Trust are doing a lot of work around it but Natural England should be assisting, is we need a database of beaver genealogies so that we make sure we avoid inbreeding…" Interviewee 5.

It is important to consider the future captive management of beavers regardless of whether wild releases will be allowed in the future. Natural England has developed a studbook in

association with the Beaver Trust and should look to collaborate with licensees, geneticists and non-governmental organisations.

4. Discussion and Recommendations

The findings of this research have provided a meaningful understanding of the two key aims of this evidence report: (1) to understand the objectives, opinions and experiences of individuals and organisations that hold a licence and (2) to understand the human and beaver activities currently occurring in the enclosures. This section will draw upon the results of the research to provide recommendations for future and current enclosures.

4.1. Advice for the licensing and proposal process

Individuals and organisations looking to propose a new beaver project will have to assess their abilities to complete two initial key stages; (1) apply and obtain a licence and (2) build a secure enclosure. Over half of the participants in this research (59%) thought that the licensing procedure was good and Natural England was asking the right questions. The licensing procedure has been updated in 2022 allowing projects to apply for a single licence instead of three separate licences. None of the participants in this research had used the updated licensing process, but it is expected that the new streamlined approach may address some of the worries about the process being overcomplicated. However, some concerns may continue, including the licensing period being too short and disagreements about where the enclosure can be placed. Evaluation of the new licensing procedure should be conducted to ensure licensees (and beaver consultants) are happy with the new process and concerns regarding the complexity are alleviated. This can be done using short feedback surveys after the licence has been granted.

As part of the licensing process, applicants are usually encouraged to add temporary or permanent artificial structures for terrestrial shelter (lodges). Where the release site has no naturally occurring deep water, licensees are urged to provide a waterbody at least one meter deep to allow for normal diving behaviours. These modifications are important as they provide beavers with safe refuge. Lodges are used for sleeping, resting, feeding and grooming (Mott, Bloomquist & Nielsen, 2011) and beavers need adequate water for swimming, protection from predators and transport building materials (Müller-Schwarze, 2011, p. 118). Although building lodges and deepening waterbodies are time-consuming activities, these should remain requirements of the licence. Participants in this research reported a high uptake in beavers' use of these structures/modifications. Twenty-five structures/modifications (or sets of the same structure – eg, 3 dams) were added to the enclosures. Eighty-four percent of these structures/modifications were used, 12% were never used and one participant did not specify if the structure had been used. Although the beavers may only use these structures/modifications for a short period of time (five lodges were used for less than six months and two lodges were used for more than six months)

they help to ensure the beavers have a safe space while they explore and settle into the enclosure.

One major concern raised by the licensees was the financial burden of setting up a beaver enclosure. The unaffordability of this was said to limit the size of the enclosure as well as prevent other landowners from being involved. Two of the interviewees supported their appeal for funding support by stating that they were providing ecosystem services and environmental benefits by having beavers on their land. On the other hand, other licensees discussed the availability of funding they obtained that enabled them to build the enclosure. It is advised that licensees are provided with the resources to share information about funding opportunities with each other. Natural England should also make information available about funding streams and online grant-finding tools, which would not only potentially help with financial burdens but also develop the relationships Natural England have with licensees (see Section 4.4).

4.2. Licensees' objectives for releasing beavers into the enclosures

During the application process for a new beaver enclosure licence, or to renew the licence, applicants must clearly identify their aims and objectives for the project which helps inform Natural England's decision-making. Ecological benefits and advantages for the waterways were the most frequently discussed objectives by interviewees. These findings were supported by the results of the online survey. The environmental benefits beavers provide are well documented in the academic literature. Beavers have been found to positively impact biodiversity (Stringer & Gaywood, 2016), and increase plant species richness and heterogeneity (Law and others, 2017). They also provide many advantages to the waterways including water flow attenuation which can aid in downstream flood management (Puttock and others, 2017, 2021), drought resilience (Fairfax & Small, 2018), and the improvement of water quality (Puttock and others, 2017, 2018). It is therefore unsurprising that 74% of the objectives relating to environmental and waterway benefits were said to have been achieved by online survey respondents. However, there is a notable number of objectives that had not yet been achieved, 26% for environmental and waterway objectives. This is to be expected as some projects have been running for less than a year and beavers may take more than a decade to restore degraded landscapes (Law and others, 2017), or in some instances, they are unable to repair the ecosystem.

4.3. Current and Future Monitoring and Research

4.3.1. An overview of current monitoring activities

Licensees identified eight reasons why they monitor including, beaver welfare, to check objectives, enjoyment, licence requirements, engagement, advance knowledge, self-motivation and advise on wild release. A large diversity of monitoring and research activities are being undertaken in licensed enclosures. The licensees identified 20 different techniques they have used, or are using, to monitor wildlife, beaver welfare/behaviour, habitat, hydrology, water quality, the fence line and public engagement. Wildlife monitoring was conducted on many species including mammals, birds, amphibians, fish, invertebrates, fungi and vegetation. Three licensees noted that although they would be happy to participate in more monitoring and research, a lot of what they are interested in has already been done or is being investigated elsewhere. In this Section (4.3), monitoring associated with beaver welfare and behaviour will be focused on. This is because licensees' observations of beaver behaviour were assessed in this research and the importance of welfare monitoring was highlighted by one of the beaver consultants.

4.3.2. Beaver Behaviour

All beaver behaviours examined in this report have come from accounts of licensees' experiences and observations. It must be noted that most behaviours are not monitored according to the results of the online survey. Only the behaviours building/maintaining dams, felling trees and constructing channels were monitored by at least 50% of survey respondents. Therefore, it must be considered that the most visible behaviours (such as building dams) may be observed most regularly, even if less visible behaviours are performed more frequently.

Twenty-three different beaver behaviours were identified through the interviews. Most of these behaviours were positive (18) although some potential abnormal behaviours were also identified (5). The positive behaviours highlighted by interviewees have important purposes, such as for safety and locomotion. For example, all licensees identified the behaviour of **building/maintaining dams** which are used to raise and stabilise the water levels which provides protection from predators and allows beavers to move construction materials (Müller-Schwarze, 2011, p. 118; Rosell & Campbell-Palmer, 2022, p. 127). Fifteen licensees said they had witnessed **tail slapping** which is used as an alarm signal to warn family members and tell rival beavers that they have been spotted (Thomsen, Campbell & Rosell, 2007). **Grooming** was identified by fifteen licensees. This is an important activity which maintains the air layer in beaver fur which aids buoyancy (Fish and others, 2002). This highlights that beavers in licensed enclosures are performing expected behaviours that tailor to their needs.

Five behaviours that may potentially indicate stress were identified including aggression, trying to escape, extended time alone, pacing fence lines and testing/digging around the fence. Patrolling the fence and escaping were the most frequently identified abnormal behaviours. Pacing is a prevalent abnormal behaviour observed in captive mammals (Rees, 2004; Shepherdson and others, 2013). However, conclusions should not be drawn without further research into the behaviour of beavers in naturalistic enclosures. In three cases, abnormal behaviours were possibly identified due to a stress stimulus, such as: being recaptured after an escape, translocation and wanting to disperse. Furthermore, these behaviours may only occur for a short amount of time after a stressful event.

4.3.3. Monitoring behaviour with camera traps

Picture 2: a camera trap trained on a beaver lodge © Catherine Wilson

A higher diversity and frequency of positive and natural beaver behaviours were reported compared to potential stress behaviours. This is supported by three interviewees specifically describing the beavers as relaxed and peaceful. However, as beavers do show potential stress behaviours (whether this is due to the enclosure or another reason), it identifies the importance of monitoring beaver behaviour. Camera traps can be used as an effective and non-invasive technique to monitor beavers' activity and body condition (Rosell & Campbell-Palmer, 2022, p. 361), and licensees are already frequently using cameras for monitoring. It is advised that they are positioned at frequently used areas such as worn-down beaver trails, lodges or feeding stations (Rosell & Campbell-Palmer, 2022, p. 361). When talking about constraints to monitoring, one interviewee said that they were able to capture beavers on camera traps, but they did not think the images were good. It is expected that this will come with experience, however, it may be beneficial to provide information, such as in the form of a video, to show licensees where and how to place camera traps so they are used efficiently.

4.3.4. Welfare monitoring: the need for future research and guidance

Both beaver consultants discussed beaver welfare when they were asked what they thought the purpose of monitoring was. Whilst one of the beaver consultants emphasised the need for welfare monitoring, the other beaver consultant had fewer concerns. Beaver consultant 2 talked about how there are currently no requirements for welfare monitoring and this should be made mandatory. Welfare monitoring is currently in Natural England's assessment criteria; however, it is not clearly stated as a requirement on all the licences. Licensees are required to report on the monitoring they have been doing but not all licences have a condition stating what the monitoring should be. From the advice provided by beaver consultant 2, it is advised that welfare monitoring (particularly body condition assessments) is clearly stated as a requirement in the licence and explained what that should entail and how frequently the monitoring should take place.

Licensees appear to have a sense of responsibility and ownership towards the beavers in their licensed enclosures. Some enclosures conduct regular welfare checks of the beavers, however, whether all licensees systematically monitor the beavers' welfare is largely unknown. In the online survey, only half the respondents stated that they conducted welfare monitoring. It is expected that the respondents who did not tick this box either do not conduct systematic welfare monitoring or they use camera traps to monitor welfare, and so ticked the box for direct observations but not welfare monitoring. As welfare monitoring was not fully addressed in this study more information should be gathered which can be done through Natural England compliance checks.

More detailed guidance on welfare monitoring would be beneficial to ensure that effective welfare monitoring occurs at all enclosures. It was recommended by the beaver consultants that welfare monitoring should include an assessment of body condition, account for all beavers in the enclosure, post-mortems and beaver behaviour. Camera traps are frequently used by licensees to assess welfare and are an effective and inobtrusive method (Rosell & Campbell-Palmer, 2022, p. 361). However, constraints highlighted by licensees should be considered. It was said to be difficult to tell apart beavers of the same generation. Some sites use ear tags but stated that they are easily groomed out. No solution was provided in this study and further consideration should be given to this issue. When discussing what should happen if a beaver is not accounted for, beaver consultant 2 suggested that this should trigger a multi-step process telling licensees what to do next. This could also be implemented in guidance for multiple welfare concerns.

4.4. Future considerations for beaver enclosures

When licensees were asked what their plans were for the beavers when their current licence had ended six online survey respondents (and three in-person interviewees)

wanted to request the release of beavers into the wild. Six online survey respondents wished to extend their current licence and two survey respondents (and one interviewee) were unsure. No licensee stated that they will not renew the licence. Licensees wanting to request wild releases of the beavers discussed a larger range of motivations compared to participants who wanted to keep beavers in the enclosure, however, both groups identified ecological and waterway benefits as important.

The future management of enclosures must be considered. Wild sub-adult beavers living in family groups will often disperse when aged between one and three years, although they will delay dispersal if necessary (Mayer, Zedrosser & Rosell, 2017). The advice from beaver consultant 2 is not to move sub-adult beavers unless they are showing signs of stress or wanting to leave. If the beavers needed to be moved, five of the interviewees said they would take advice from the experts but there was a preference for the offspring to go either to another enclosure or to be released into the wild. Beaver consultant 1 stated that dispersing sub-adults from enclosures should be used alongside Scottish beavers to restock the English landscape if wild releases become authorised.

Four measures were discussed by licensees regarding the considerations needed for successful wild beaver releases if they are allowed in the future. These were: collaboration, employment of beaver officers, training/education and funding. As beavers have been absent from the English landscape for a significant amount of time, licensees discussed the apparent lack of knowledge about them; from the public to veterinary experts. Educational information for the public, landowners and river users should be distributed throughout several platforms, such as the gov.uk and non-governmental organisation websites, for wide coverage. Education for landowners and river users needs to include mitigation techniques to ease potential conflicts and promote acceptance. Education and beaver officers have previously been discussed as future management options in Natural England's report, ‘Advice and recommendations for beaver reintroduction, management and licensing in England’ (Pouget & Gill, 2021). It was advised in this report that each wild release project would need a local Beaver Project Officer who could provide a range of support to river users and landowners (including mitigation measures) as well as lead on education, monitoring and training volunteers (Pouget & Gill, 2021). A National Beaver officer was employed by Natural England in 2022 to be the main point of contact for the public and stakeholders as well as support projects and manage partnerships.

Collaboration was the most frequently talked about measure needed for successful wild release and was discussed by five interviewees. They considered the need to collaborate between themselves, the public, Natural England and other potential partners. There may be an opportunity to expand the networks between the licensees, such as through social media, to allow them to share experiences and ask questions to a group of people in a similar position to themselves. Natural England should look at ways to build its relationships with licensees. One interviewee discussed the conflict between the licensees and the re-introduction policy, and how they thought the relationship between themselves and Natural England should be improved. It is advised that Natural England regularly

share updates and news with licensees. This can update the licensees on the work that Natural England is doing for the introduction of beavers, provide helpful monitoring tips, send reminders to report beaver activities as well as provide recognition to the licensees. This may help foster a better understanding between licensees and Natural England.

5. Limitations

There are limitations in this evidence report that are worth noting. First, the interview guides and the online survey were created simultaneously. Therefore, although the questions asked in the interviews and on the survey reflect each other, the answers from one method of data collection have not greatly influenced the questions asked in the other form of data collection. For example, the objectives identified by interviewees do not perfectly match the pre-determined objectives provided in the online survey multiple choice questions. This was because of the limited time available to do the fieldwork as the primary researcher was contracted for three months to complete this evidence report. However, there are still many similarities between the answers given by interviewees and predetermined answers that survey respondents could choose from because the survey was created with support from the academic literature and Natural England employees.

The second limitation is that for some questions (such as ‘do you see beavers in licensed enclosures as wild or captive’) there was a small sample size of participants answering the questions. As there was a short time available for fieldwork and interviews were dependent on participant availability, beaver consultant interviews and in-person licensee interviews were conducted at the same time. Therefore, the development of the interview guide (after beaver consultant interviews) occurred after the licensee's in-person interviews. Because of this a small sample of five licensees, who participated in online interviews, was asked the additional questions that arose from the beaver consultant interviews. Although only five licensees were asked these questions it must be considered that, at the time of writing, there were 27 licensed beaver enclosures. Therefore, by asking five licensees about their opinions and experiences, the perceptions of licensees from 19% of the licensed beaver enclosure sites in England are captured. However, when there are small sample sizes the results should be interpreted with caution and further research is advised on the topic. Despite some of the limitations of this report, the results are expected to provide an accurate view of licensees' perceptions and values, and the activities occurring in licensed enclosures. This confidence is due to the mixed methods research used, in which the data collected in the online surveys reflect the findings of the interviews.

6. Priorities for Future Research

In this section, the advice provided throughout this report about future research that should be considered is compiled. The following three recommendations have been identified as the most important for future research. Other research recommendations, suggestions for best practices and advice can be found in the discussion (Section 4).

- Concerns regarding the old licensing process, which required the application for three separate licences, were raised by some licensees within this research. In 2022, a new licensing procedure was developed allowing projects to apply for a singular licence. No participants in this research had used the new licensing procedure. Therefore, there is a need for a systematic evaluation of the new licensing process to ensure the concerns raised in this research have been alleviated. This could be conducted as a feedback survey after a project has been granted a licence.

- Research assessing beaver behaviour in licensed enclosures should be conducted. For example, creating activity budgets using camera traps across multiple sites. Although most licensees reported the beavers being relaxed, there were also reports of potential stress behaviours. It is important to understand the prevalence of some of these behaviours, the stimulus causing potential stress (such as sub-adults wanting to disperse) and evaluate how long these potential stress behaviours are displayed.

- It is important to address welfare monitoring in future research projects. In this research, it has been highlighted by a beaver consultant that welfare monitoring should be prioritised and needs to be clearly stated on the licence as a requirement. It was beyond the scope of this study to assess the number of licensees who conduct frequent systematic welfare checks on the beavers. Further research should assess this and analyse what is being measured in welfare monitoring. This could be done as a research project or as part of Natural England's compliance checks. Additional guidance in the licence requirements would be beneficial to advise on the frequency that welfare checks should be done as well as body conditions and behaviours that should be looked for. The difficulties that licensees may face when conducting welfare checks, such as telling the beavers apart, need to be considered and future work should look for solutions to lessen these issues.

7. Conclusion

At the time of writing, all licensed beaver releases in England occur in naturalistic, secure enclosures as wild releases are not permitted. This research builds upon previous studies looking at the release of beavers into enclosures. The objectives of this research were to: (i) understand the objectives, opinions and experiences of individuals and organisations that hold a licence and (ii) to understand the human and beaver activities currently occurring in the enclosures.

Licensees identified seven key objectives for releasing beavers into the enclosure during the interviews. The most prevalent objectives were ecological purposes and the benefit to the waterways. Online survey respondents identified that 87% of objectives were being monitored and 68% of objectives have been achieved. Licensees provided eight reasons why they monitored including, enjoyment, check objectives and beaver welfare. Many of the monitoring activities conducted focused on wildlife, vegetation, habitat and waterways. Once the current licence ended, licensees discussed their desire to either have a wild release of beavers or to renew the enclosure licence. Popular motivations for the licensees that want wild releases and those who want to continue the enclosure included the ecological benefits and advantages for the waterways. All these results highlight the determination licensees have to help the environment, from their project objectives to their hopes for the future of beaver introductions.

A wide diversity of beaver behaviours was witnessed by licensees, with three interviewees specifically stating that the beavers appear peaceful. Most behaviours discussed were positive although there were some accounts of potential stress behaviours. Most licensees added structures (such as lodges or the foundations of a dam) and/or a beaver pond to the enclosure before releasing beavers. These have had much success with 84% of the structures, or sets of structures, being used. There is a lot of monitoring coming out of the enclosures, however, one beaver consultant identified the lack of a requirement for welfare monitoring (such as assessing body condition). It is recommended in this report that further guidance is provided on welfare monitoring, particularly the frequency of monitoring and what the licensees should be looking for. Finally, licensees identified four measures that should be implemented to increase the success of wild releases, if allowed. These were: increase collaboration, employment of beaver officers, the need for training/education, and funding for mitigation. To help Natural England and licensees to develop their relationships it is recommended that Natural England regularly communicate with licensees to inform them of the work Natural England is doing and highlight opportunities.

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9. Appendices

9.1. Licensee Online Survey Questions

Objectives:

1. If you are willing, please provide your licensee's number. This will not be used within the research publication (which is anonymous) but will be used confidentially by Natural England to allow them to update their information about the enclosures and help them understand what is working. If you decide not to supply your name then this questionnaire will be completely anonymous. (optional question).

2. When were beavers first released into the enclosure?

3. Please select your primary and secondary objectives for releasing beavers within the enclosure site. Please select all which apply. Using the options provided, please indicate the level of achievement for each objective and discuss the constraints to achieve them.

Objectives	Please select the primary objectives for releasing beavers to your site (you may select more than one).	Please select the secondary objectives for releasing beavers to your site (you may select more than one).	Please indicate if these objectives have been achieved or not achieved and if monitoring has stopped or is ongoing	Have there been any constraints preventing you from achieving your objectives?
Flood risk management and increased water storage capacity			*(1)The objective has been achieved and monitoring has continued* *(2)The objective has been achieved and no monitoring is occurring at this time* *(3)The objective has not been achieved and monitoring is ongoing* *(4)The objective has not been achieved and no monitoring is occurring at this time* *(5) Unsure*	

Objectives	Please select the primary objectives for releasing beavers to your site (you may select more than one).	Please select the secondary objectives for releasing beavers to your site (you may select more than one).	Please indicate if these objectives have been achieved or not achieved and if monitoring has stopped or is ongoing	Have there been any constraints preventing you from achieving your objectives?
Improving water quality				
To help restore natural processes				
To help restore natural processes				
As part of a wider rewilding project				
To improve habitat				
To have beavers present in the area				
To improve biodiversity				
Education and awareness				

Objectives	Please select the primary objectives for releasing beavers to your site (you may select more than one).	Please select the secondary objectives for releasing beavers to your site (you may select more than one).	Please indicate if these objectives have been achieved or not achieved and if monitoring has stopped or is ongoing	Have there been any constraints preventing you from achieving your objectives?
Tourism and visitor attraction				
Other 1				
Other 2				
Other 3				

3a. If you selected other please provide more information

Monitoring:

4. Please select the techniques you have been using to monitor the beavers and/or the changes they make to their environment. For those monitoring techniques you have been using please indicate if you have been repeating the monitoring.

Monitoring Technique	Please indicate if you have used this monitoring technique to monitor the beavers or the environment	Please tick if this monitoring technique has helped you achieve your objectives	Have any constraints been preventing you from using this monitoring technique?
Baseline environmental data collection (environmental surveys before			

Monitoring Technique	Please indicate if you have used this monitoring technique to monitor the beavers or the environment	Please tick if this monitoring technique has helped you achieve your objectives	Have any constraints been preventing you from using this monitoring technique?
beavers are released).			
Field sign surveys of beavers (eg, signs of beaver activities such as dams)			
Direct observation of beavers (in-person or camera traps)			
Welfare surveying for beavers (such as birth/death recording, post-mortem and disease screening).			
Environmental parameters (such as habitat changes or water quality)			
Other species monitoring			

Monitoring Technique	Please indicate if you have used this monitoring technique to monitor the beavers or the environment	Please tick if this monitoring technique has helped you achieve your objectives	Have any constraints been preventing you from using this monitoring technique?
Drone monitoring			
eDNA analysis			
Monitoring of public perceptions about beavers			
Other 1			
Other 2			
Other 3			

4a. If you selected other please provide more information.

5. Please could you discuss more specifically what monitoring techniques you use? Please include who does the monitoring, how often they do it, and what technique is used.

6. How confident are you that the monitoring techniques used can identify the presence of all the beavers in the enclosure?

Very confident *Confident* *Unconfident* *Very unconfident*

Behaviour and ecology:

7. How many adult and sub-adult beavers (beavers over 2 years old) are currently in the enclosure?

8. Have any beavers died in the enclosure?

8a. *(If yes)* Please state how many have died, when this happened and the cause of death if known.

9. Do you suspect that any of the beavers have escaped?

   9a. *(If yes)* Please state how many have escaped, how and when this happened, and if they were recaptured.

10. Have the beavers had kits?

    10a. *(If yes)* How many have they had and what year were they born?

11. Please select the beaver behaviours below that have been recorded or observed within the enclosure and which behaviours you have specifically monitored for.

Behaviour	Please indicate which behaviour(s) or signs of behaviours have been observed in the enclosure. Please select all that apply.	Please select the behaviours you have specifically monitored for. Please select all that apply.
Breeding		
Grooming self		
Grooming others		
Building dams		
Felling trees for construction		
Creating burrows and lodges		
Constructing channels		
Building winter food stores		
Territorial behaviour (such as scenting)		

Behaviour	Please indicate which behaviour(s) or signs of behaviours have been observed in the enclosure. Please select all that apply.	Please select the behaviours you have specifically monitored for. Please select all that apply.
Tail slapping on the water		
Escaping enclosures		
Patrolling the fence		
Digging around the fence		
Aggression or rejection towards (potential) mate		
Parent showing aggression towards sub-adult offspring		
Parent showing aggression towards kit offspring		
Other 1		
Other 2		
Other 3		

11a. If you selected other please provide more information

12. Were any artificial structures (such as ponds, lodges or beaver dam analogues) created within the enclosure prior to release? If yes have the beavers been seen to use these features?

Research aims:

13. Please select if any long-term scientific research has been conducted on:

The habitat in and around the enclosure *The beavers'*

Other species (not beavers) present in the enclosure

13a. Please discuss what research has been done on the habitat and how long the research has been conducted.

13b. Please discuss what research has been done on the beavers and how long the research has been conducted.

13c. Please discuss what research has been done on other species (not beavers) and how long the research has been conducted.

14. Has any long-term scientific research that has been conducted led to publication?

14a. If yes: Please state where the research has been published.

15. If you have conducted scientific research would you be willing to share the research data with Natural England?

Long Term plans

16. What are your plans when your current licence has ended?

Request to extend the current license *Request to release the beavers into the wild*

We will not be renewing the license *Unsure*

16a. What are your plans for the beavers once your licence has ended?

16b. (*if choose to extend the current license*) How many more years do you anticipate running your enclosure project?

1- 5 years *6 - 10 years* *11 - 15 years* *In perpetuity*

16c. *(if chose unsure)* Please explain why you are unsure of your next steps. What would help you make a decision?

16d. At around two years old beavers leave their parent's territory and find their own territory to inhabit. If there are kits or sub-adults in your enclosure what are your plans for them once they mature?

16e. (*if chosen to extend licence or release into the wild)* What are your motivations to request either the extension of the licence or the request to release beavers into the wild?

17. Reflecting on the licensing procedure, are the questions asked in the application still applicable to the setup and running of the enclosure, and is Natural England asking for the right information in their licence application forms?

18. Are there any lessons that you have learned throughout your time holding a beaver license? Or is there anything else you would like to mention?

9.2. Licensees Interview Guide

Those questions with an asterisk (*) at the end indicate that this question was added to the guide part of the way through the research. Licensees who participated in the questionnaire before being interviewed were asked additional questions about their responses.

Please note these were semi-structured interviews. Therefore, the interview was partially researcher-led and partially interviewee-led. Topics that are not in this interview guide may have also been covered.

- When were the beavers released into the enclosure?
- Are your objectives target-driven or process-driven?*
- What were your objectives for releasing beavers into the enclosure?
- Have these objectives been achieved or do you think you will be able to achieve them?
- Do you think there is a difference between research and monitoring?*
- Why do you monitor? Is it just for the objectives or does it have another purpose?*
- What monitoring techniques do you use?
- How do you monitor for beaver welfare and how frequently?*
- Were there any constraints to your monitoring?
- How many beavers do you have in the enclosure?
- Do you see the beavers in the enclosure as wild or captive?*
- Have any of the beavers died or escaped?
- Have the beavers had kits?
- What beaver behaviours have you seen?
- Have you seen any behaviours relating to stress?
- Did you build any artificial structures and did the beavers use them?
- Has any long-term scientific research been conducted?
- Would you be willing to share your monitoring and research data with Natural England?
- What are your plans when the current licence has ended?
- What do you hope to do with the beaver offspring when they want to disperse?
- Do you have any comments about the licensing process?
- Is there anything I have missed that you would like to discuss?

9.3. Beaver Consultant Interview Questions

Please note these were semi-structured interviews. Therefore, the interview was partially researcher-led and partially interviewee-led. Topics that are not in this interview guide may have also been covered.

- What are the most important considerations when applying for and setting up an enclosure (ask about artificial structures)?
- Why is there a need to monitor enclosures?
- What monitoring would you suggest for the beavers and the environment?
- What beaver behaviour would you expect to see?
- Do you think that monitoring for stress behaviour is important to do?
- Do you view beavers in licensed enclosures as wild or captive?
- What should be done with sub-adults when they grow up?
- What are the concerns, constraints and advantages of wild release in the future?

9.4. Positionality

Positionality refers to the position a researcher takes within a study. The lead author's positionality will be taken into account by assessing their relation to the subject and describing how they are expected to be perceived by the participants. Natural England also has a large impact on the study and so their relation to the subject is also considered.

The lead author, Catherine Wilson, is a PhD student who has conducted this research on behalf of Natural England as part of a three-month internship. She is an interdisciplinary researcher who started her training in Zoology and Primatology for her undergraduate and master's degrees and then move into environmental education for her PhD, which focuses on research with stakeholders. Catherine has never worked with beavers or Natural England in the past. She considers herself an outsider to this research, due to the fact she is not a licensee or beaver consultant and so not part of the same group as her participants. However, there are aspects of her experiences (such as her degree in Zoology) that have allowed her to connect with the participants. Catherine’s position as an outsider, and the fact she has never worked on beaver releases, allowed her to bring fewer presumptions to this research.

Natural England is the government's adviser for the natural environment. It provides practical advice, grounded in science, on how best to safeguard England's natural wealth for the benefit of everyone. Natural England is the licensing authority for beaver enclosures.

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