APPLICATION TO SCOTTISH GOVERNMENT

BY

THE ROYAL ZOOLOGICAL SOCIETY OF SCOTLAND AND SCOTTISH WILDLIFE TRUST FOR A LICENCE UNDER SECTION 16(4) OF THE WILDLIFE AND COUNTRYSIDE ACT 1981, AS AMENDED, TO RELEASE EUROPEAN BEAVER, *Castor fiber*, FOR A TRIAL RE-INTRODUCTION IN KNAPDALE, ARGYLL

The Royal Zoological Society of Scotland, Scottish Wildlife Trust

21st December 2007

SUMMARY

This is an application to Scottish Government by The Royal Zoological Society of Scotland and Scottish Wildlife Trust (the Principle Applicants) for a licence under section 16(4) of the Wildlife and Countryside Act 1981, as amended, to release European beaver, *Castor fiber*, for a trial re-introduction in Knapdale, Argyll.

Evidence suggests that the European beaver was resident in Scotland until about the 16th century, when it was persecuted to extinction by over-hunting. Since 1995, Scottish Natural Heritage has been investigating the potential for restoring this species to the native fauna of Scotland. This work is in line with requirements on the UK Government, under Article 22 of the 'Habitats Directive'. If re-introduced, evidence suggests beavers would have a beneficial effect on Scotland's wider biodiversity as a result of the effects of their foraging and engineering activities on woodland and aquatic habitats.

SNH have compiled a suite of information with regard to the scientific plausibility and desirability of conducting a re-introduction. A national consultation commissioned by SNH in 1998 demonstrated that a majority of the public were in favour of a re-introduction although some concerns were expressed by certain interest groups. Therefore a scientifically monitored, time-limited and site specific trial re-introduction is proposed by The Scottish Beaver Trial in order to:

- Study the ecology of the beaver in the Scottish environment
- Assess the effects of beaver activities on the environment, including a range of land uses;
- Generate information during the proposed trial release that will inform a potential further release of beavers at other sites with different habitat characteristics;
- Explore the environmental education opportunities that may arise from the trial itself and the scope for a wider programme should the trial be successful
- Determine the extent and impact of any increased tourism generated through the presence of beaver

A good quality site for a trial re-introduction has been identified at Knapdale, mid Argyll, which is managed by Forestry Commission Scotland. A satisfactory level of support for a trial re-introduction at Knapdale has been received during a local consultation. A suitable donor population has been identified in Norway and Norwegian expertise is available for the capture of animals. Strategies have been drawn up to ensure the proper management of the beavers in quarantine prior to release and post release at Knapdale.

The proposal is to collect three beaver families from the donor country in autumn 2008. There will then follow a six month period of quarantine. Three beaver families will then be released at Knapdale in spring 2009. They will be studied for a five year period until spring 2014.

The cash cost of the core scientific project will be in the region of £850,000 for the six year period beginning April 2008. The Principle Applicants request that Government grants a licence for the trial release of European beaver into the wild in Scotland at Knapdale, Argyll, under Section 16(4) of the Wildlife and Countryside Act 1981 as amended.

1 INTRODUCTION

Written and archaeological evidence suggests that the European beaver was once widely distributed throughout mainland Scotland. Beaver remains are not well preserved and these records provide limited information on the precise distribution and population status of the species in Scotland before they became extinct. However, an investigation into its history shows that the beaver was resident in Scotland until the 12th century, although there is strong evidence that it persisted until a much later date, possibly the 16th century (Conroy & Kitchener 1996).

The extinction of beaver in Scotland, and across the whole of Britain, has been attributed largely to hunting for its valuable pelt and the medicinal properties of the secretion from the castor sacs (the 'castoreum'). Habitat destruction is considered to have been a contributory factor in the decline although this was probably secondary to the effects of hunting.

The demise of the species in Scotland mirrors the pattern of decline elsewhere in Europe and, by the end of the 19th century, the European beaver was close to extinction across its range. Only three small and isolated relict populations survived in western Europe at this time (in Norway, France and Germany). However, re-introductions and translocations of the species have now taken place in 21 European countries.

The European beaver is the focus of new action over the next 5 years as described in the Species Action Framework launched in 2007 by the (then) Scottish Executive and petitioned by the public and published by Scottish Natural Heritage.

The Royal Zoological Society of Scotland (RZSS) is a registered charity founded in 1909 in Edinburgh and currently has a membership of 24,000. RZSS has since developed its' two living collections at Edinburgh Zoo and the Highland Wildlife Park which in total welcome over 700,000 visitors each year. It has an award-winning environmental education programme conducted at its' two main sites and through a nationwide outreach initiative and an extensive international conservation programme.

The Scottish Wildlife Trust (SWT) is a registered charity with the objective of advancing the conservation of Scotland's biodiversity for the benefit of present and future generations. With over 30,000 members, SWT manages 123 wildlife reserves totalling 20,000 hectares, conducts practical conservation work and provides a voice for wildlife at national and local levels. The work of the Trust is carried by a combination of volunteers and staff. Local presence is provided by a network of 21 members centres and there are 22 children's groups. Funding comes from grants, membership subscriptions, donations and legacies.

1.1 Aims

To undertake a scientifically monitored trial re-introduction of the European beaver to Knapdale, mid-Argyll, for a five year period in order to:

- Study the ecology and biology of the European beaver in the Scottish environment
- Assess the effects of beaver activities on the natural and socio-economic environment.
- Generate information during the proposed trial release that will inform a potential further release of beavers at other sites with different habitat characteristics;

- Determine the extent and impact of any increased tourism generated through the presence of beaver
- Explore the environmental education opportunities that may arise from the trial itself and the scope for a wider programme should the trial by successful

2 Statutory and Strategic Framework

Article 22 of the European Community *Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna* (Council Directive 92/43/EEC, the 'Habitats Directive') states that Member States shall;

'study the desirability of re-introducing species in Annex IV that are native to their territory where this might contribute to their conservation, provided that an investigation, also taking into account experience in other Member States or elsewhere, has established that such re-introductions contributes effectively to re-establishing these species at a favourable conservation status and that it takes place only after proper consultation of the public concerned.'

European beaver is listed on Annex IV. No work is currently planned for the restoration of any other species listed in Annex IV of the Habitats Directive.

The Habitats Directive requires that any restoration should take place only after 'proper consultation of the public concerned'. Such a consultation was undertaken by SNH in 1998 in order to gather views on the desirability and acceptability of restoring beaver to Scotland. The results of this consultation were published by SNH (Scott Porter Research & Marketing Ltd, 1998). A further local consultation was undertaken in 2000 once the proposed Knapdale trial site had been announced.

In addition to the original licence application in 2002, further evidence was supplied by SNH to the then SE in January 2005 in response to questions on the impact of beavers on habitat components within the release area. This case remains valid within the context of this licence application and is provided in Annex 3.

The local consultation was repeated in the autumn of 2007 prior to this second application being submitted, the detail of which is appended as Annex 4

As described above the European beaver has been included in the SNH Species Action Framework with the following justification:

"*The European beaver meets criterion 1b of the Species Action Framework as a species for conservation action. It is listed on Annex IV (and Annex II) of the EC Habitats Directive. The Directive requires European Union Member States to study the desirability of reintroducing such species where they have become extinct. The beaver also qualifies for the Species Action List since we now have a large amount of ecological information on the species which can inform management actions. Effective species management action can be identified, namely the identification of a suitable site and the running of a reintroduction project, subject to the receipt of a licence. The beaver is a charismatic species which would serve to raise wider biodiversity issues such as riparian woodland management, aspen restoration, wetland biodiversity and dead wood habitat. There are few species which have such significant influences on ecosystem function and health*"

The current proposal for a study is in line with requirements on the UK Government under Article 22 of the Habitats Directive to consider the desirability of re-introducing species listed on Annex IV.

The current Scottish Forestry Strategy (2006) includes a clear desire to deliver on the following biodiversity values:

• Help to halt the loss of biodiversity, and continue to reverse previous losses
• Increase awareness and public enjoyment of biodiversity, especially close to where people live or visit
• Improve the knowledge of, and evidence base for, biodiversity and ensure biodiversity considerations are integrated into decision-making.

2.1 Legal position

As the European beaver is not resident in the wild in Scotland, any animals which are released will receive no specific protection under domestic conservation law.
The beaver is not currently resident within the UK and is not, therefore, covered under any domestic legislation. Consequently it receives no specific legal protection in Scotland.
Current domestic legislation makes it illegal to release to the wild any animal which is not ordinarily resident in Great Britain (Section 14 of the Wildlife & Countryside Act 1981 (as amended)). Any release, therefore, would have to be approved and licensed by Government.

The European beaver is currently listed on Annexes II (animal and plant species of Community interest whose conservation requires the designation of Special Areas of Conservation) and IV (animal species of Community interest in need of strict protection) of the Habitats Directive. This confers wider protection on the European beaver where it is currently resident on the Continent but does not oblige protection in Britain for a non-resident species. Given the very limited nature of the current study, no proposals are being presented nor thought necessary for any permanent amendments to domestic legislation at this stage.

However, in view of this, consideration must be given to the long-term status of the species in Britain should the trial be successful then it may become appropriate that a case be considered for the addition of the species to the appropriate schedule of both the Wildlife & Countryside Act 1981 (as amended) (Schedule 5) and The Conservation (Natural Habitats, &c.,) Regulations 1994 (Schedule 2). The former would be required to implement the Bern Convention in Britain whilst the latter would be required to comply with the obligations of the Habitats Directive for a resident species. Decisions on this matter would be a subject for the Scottish Government to consider.

Trial animals will remain the property of the project partnership until such times as they are removed (if the trial is unsuccessful) or they are considered to be a resident part of the British fauna. The latter will require an assessment of the species' status following the period of the trial. This will require full scientific support for consideration by the Government.

The proposal presented by RZSS/SWT is for the release of a small number of European beavers at Knapdale Forest to allow a trial re-introduction scientific study. Domestic legislation makes it illegal to release into the wild any animal which is of a kind not ordinarily resident in Great Britain (Section 14 of the Wildlife & Countryside Act 1981 (as amended)). Any restoration, therefore, is subject to approval and licence under Section 16 of this Act.

2.2 Public Consultation

Work was completed initially to confirm the historical presence of beavers in Scotland (Conroy & Kitchener, 1996). This was followed by research to identify the extent of habitat suitable for beavers across Scotland (Webb *et al*. 1997) whilst a desk-based research study was conducted simultaneously to develop a method of assessing specific sites against the suitability for supporting viable beaver populations (Macdonald *et al* 1997). The likely impacts of beaver occupation on local hydrology and native fish populations were investigated through literature reviews and collation of information from countries where beavers are already resident (Gurnell, 1997; Collen, 1997). A recent study suggests that the presence and activities of beaver have very little negative impact of salmon and sea trout reproduction (Parker et al 2007)

This information was used to support the conduct of the national consultation held in 1998 (Scottish Natural Heritage, 1998). During the national consultation, the proposal was put that a 'full' re-introduction of the European beaver take place. Three types of survey were undertaken during the consultation;

1. In a 'passive public' opinion survey involving 2,141 interviews, 63% of the general public supported a re-introduction, 12% were against, and 25% had no view.

2. A total of 1,944 written responses were received during a 'pro-active public' survey. Overall, 86% of this sample was in favour of the re-introduction. A smaller majority of land managers and those with interests in forestry supported re-introduction. However there was a lack of support from those with interests in fishing and agriculture.

3. A total of 281 consultees were also approached of which 144 (51%) responded. Reactions were mixed. Conservation and academic sectors were the most supportive, fishing/angling interests the least supportive.

The outcome of this consultation was subsequently placed in the public domain for discussion (Scott Porter Research & Marketing Ltd, 1998). The consultation demonstrated that a majority of the public were in favour of a re-introduction but certain interest groups raised a number of specific concerns. Consequently, the SNH Board agreed in November 1998 to progress with the development of a scientific trial re-introduction for a fixed period and in a limited area to test the feasibility and effects of beavers being re-introduced to a Scottish environment. During the national consultation process, Forestry Commission Scotland (FCS) had suggested that the FCS estate could be used for a trial, subject to certain conditions, and this proposal was re-visited at a later stage (see below).

Following the Board decision, further work (Kitchener & Lynch, 2000) was conducted to investigate the most suitable source of beavers for re-population of Scotland through the comparison of fossil remains in Britain with extant populations in Europe and Scandinavia. A review, commissioned jointly with FCS, collated the evidence on the likely impact of beaver presence on woodland habitats (Reynolds, 2000) and a predictive model was developed to ascertain the number of animals required for a re-introduction and the potential survival of the released animals (Rushton *et al.* 2000). All of the above information has been published.

Prior to confirming the site currently proposed (Knapdale Forest), a Geographic

Information System (GIS) study was commissioned by SNH to identify sites which were suitable for a trial release (Carss *et al*. 1999). This work refined the earlier assessment of suitable habitat, setting additional criteria specific to a trial situation, e.g. containment, provision for research on impacts of land uses. Following this, in 1999, SNH entered discussions with FCS over the possibility of conducting a trial on its land-holding. Two potentially suitable sites were identified through GIS-analysis (see Section 2.1) and were subsequently examined in greater detail (Daniels *et al* 2000). Of these, Knapdale Forest was considered to be the most suitable. An approach was made to FCS on this basis whereupon the Forestry Commissioners agreed in principle to host a trial conducted by SNH, subject to a number of conditions which will be linked to a lease agreement for the site in Knapdale Forest. The trial will therefore take place on the FCS estate at Knapdale.

The Scottish Beaver Trial is a collaboration between Scottish Wildlife Trust and The Royal Zoological Society of Scotland. There will be two tiers of management for the project with initial planning, consultation and national overview being the responsibility of the Beaver Steering Group. The implementation of the work on the ground will be the responsibility of the Beaver Project Team. A stakeholder forum has been established to allow others to feed into the management process. A local beaver supporters group will be established and enabled to contribute practically to the trial.

RZSS, SWT, in collaboration with its partner organisations, will maintain an engagement with local community and wider public through the following mechanisms:

- regular issue of press releases to local and national media throughout duration of trial. In general we aim to establish a good and open relationship with the media, particularly locally;
- co-operate as far as possible with the makers of television documentaries who are interested in the project;
- regular issue of a newsletter to the local community throughout the trial;
- the provision of interpretation and educational materials.
- involvement of universities in research projects at Knapdale e.g. for student dissertations.
- provision of local interpretation and education for interest groups on-site and off-site;
- involvement of the local schools in the project.
- the provision of local volunteering opportunities connected with various aspects of the trial.
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2.3 Local Consultation

A local consultation process in the Knapdale area was initiated in October 2007. The feedback received at the time of production of this licence application is provided in annex 4

3 LOCATION

3.1 Site identification

Work to identify a specific trial site on FCS land-holdings was undertaken in 2000. SNH conducted a GIS analysis using data sets produced by the Institute of Terrestrial Ecology (ITE) (Webb *et al.* 1997). A key enhancement of the analysis was that an improved woodland dataset (the Millennium Woodland Database) which highlighted

suitable beaver habitat across Scotland north of the central belt. This distribution was overlaid with FCS land-holdings data. While the initial report demonstrated that high quality release sites were both numerous and widespread, a short list of FCS sites was identified, and for each site a preliminary assessment was made as to its ecological and practical suitability. Following further examination and discussions between SNH and FCS staff, the initial list was shortened to three specific sites; Knapdale, Loch Awe and Loch Shiel.

Knapdale was finally judged to be more suitable for a trial for additional practical and logistical reasons and remains the favoured site for the proposed release in 2009.

3.2 Knapdale

SWT have over 25 years of experience of working in partnership with FCS at Knapdale and through the work of both staff and local volunteers have extensive knowledge of this particular area.

The proposed trial site includes a SSSI (Knapdale Woods SSSI), notified for its breeding birds, bryophytes, lichens, dragonflies, loch trophic ranges and upland oak woodland. It is also part of a wider SAC (Taynish and Knapdale Woods) put forward for its oak woodland, freshwater lochs, marsh fritillary butterfly *Euphydryas aurinia* and otter *Lutra lutra* interests. At the time of the previous licence application in 2002 an 'appropriate assessment' of the proposed trial at Taynish and Knapdale Woods SAC was undertaken, in terms of Articles 6.3 and 6.4 of the Habitats Directive, as enacted through Regulations 48 and 49 of the Conservation (Natural Habitats etc.) Regulations 1994 (the 'Habitats Regulations'), for the trial re-introduction of the European beaver *Castor fiber* to Taynish and Knapdale Woods SAC.. On the basis of the analysis undertaken, it was considered there will be no adverse impact on site integrity as a result of the trial re-introduction of the European beaver to Knapdale. To provide further reassurance, particularly regarding cumulative impacts which cannot be precisely modelled in advance, a monitoring programme will form an integral part of the trial. This will measure overall changes, if any, in each qualifying feature against baselines established before the trial begins. The results will be formally assessed against the conservation objectives every 6 months. An exit strategy (see Section 7.6) for the project has been incorporated into the project in case the trial needs to be terminated at any time.

The Knapdale peninsula (see map in annex 1) in mid Argyll is bounded to the north by the Crinan Canal, the south by east and west Loch Tarbet, on the east by Loch Fyne and on the west by the Sound of Jura. The landform of the northern part of the locality containing the trial site, Knapdale Forest, is dominated by a unique landscape comprising a whole series of northeast – southwest aligned ridges (knaps) and small valleys (dales) which range in altitude from sea level to 276 m. The western sea bound and central sections of Knapdale Forest (the 'core area' where the beavers will be released, OS grid reference NR7990) are heavily bisected by the knaos and a series of sea and freshwater lochs. The freshwater bodies extend from small lochan up to 2 km long lochs which are interconnected and drained by small burns streams draining to the sea in a southern direction.

The semi-natural vegetation of Knapdale in the late 19th century comprised a complex mosaic of broadleaf woodland dominated by abandoned oak coppice and small patches of improved grazing (and arable fields). The higher elevation land was comprised of *Calluna/Molinia* dominated by heather and grass sheep walks. 20th

century afforestation by the FC mainly in the 1930s-50s, but continuing up until the early 1980s, resulted in Knapdale Forest. A range of conifer species primarily Norway and Sitka spruce were established on open ground and as a replacement for broadleaf woods which were felled, inter and under planted. From 1985 onwards following a major review of broadleaf forest policy a major programme of conifer harvesting and felling to recycle has taken place in the core area of native woodland in Knapdale. This has been accompanied by a major effort by FCS forest ranger staff to reduce the resident deer population from levels in excess of 20 deer per km^2. This has resulted in significant levels of natural regeneration of native woodland. Broadleaves, predominantly birch *Betula* spp., and to a lesser extent willow *Salix* spp., alder *Alnus glutinosa* and hazel *Corylus avellana* are mainly associated with the lochs. Oak *Quercus* spp., sycamore *Acer pseudoplatanus* and scattered aspen *Populus tremula* also occur but are mostly confined to the Fairy Isle and Bàrr Mor peninsulas in the south west of the area.

The core area of the site for the beaver trial, which is dominated by the interconnecting freshwater loch system and associated broadleaf-dominated woodland, covers approximately $15km^2$. Within this there is currently about 15km of riparian habitat suitable for beaver. This figure is expected to increase as FCS continue their programme of habitat restoration. The landform and resultant hydrology coupled with the distribution of forest and riparian habitats suitable for beavers will provide a reasonable prospect of natural containment. The steep escarpment along the north boundary, the conifer plantations to the east and west and the saltwater lochs to the south and west are the main barriers to beaver movements. The short watercourses are the likely routes for beaver movement around the site although beavers have been recorded moving short distances across seawater when dispersing.

The area also forms part of the North Knapdale National Scenic Area and the forest also hosts a number of low key FCS recreation facilities comprising an information and interpretation centre, a series of walking and cycling trails and several public car parks.

The site has been notified as a SSSI and is part of a wider SAC (Taynish and Knapdale Woods) put forward for its oak woodland, freshwater loch, marsh fritillary butterfly *Euphydryas aurinia* and otter *Lutra lutra* interests. The area also lies within the North Knapdale National Scenic Area. The forest also hosts a number of low key FE recreation facilities comprising an information and interpretation point, a series of walking and cycling trails with onsite interpretation. The lochs are fished by local angling associations. The whole site is subject to FCS's policy of open access exercised under the FCS bylaws. These access and recreational opportunities are important locally as a resource for communities and tourists. Knapdale is a working forest where a range of forest operations will be ongoing. These will be undertaken in accordance with a forest design plan approved by FCS following consultation with key stakeholders (including SNH) and local communities. The SSSI/pSAC are managed in accordance with a specific plan agreed by SNH. All forest management is undertaken to the standards set by the UK Forest Standard and UK Woodland Assurance Scheme independently audited by Forest Stewardship Council (FSC).

The Knapdale Forest, like much of the surrounding area is rich in archaeological history and remains. The trial area contains 13 Scheduled Ancient Monuments (SAMs) and 125 Unscheduled Ancient Monuments (USAMs). All scheduled sites are recognised within the forest design plan and are covered by legally binding SAM management plans between FCS and the national governing body, Historic Scotland. The trial partners will work with Historic Scotland to ensure that the trial causes no significant detrimental impact upon the sites' archaeological heritage.

In light of the fact that FCS are continuing with its programme of conifer removal within much of the potential trial area; the deer population is under control and regeneration of native woodland is good. The Knapdale Forest has the following advantages as a trial site:

- it is ecologically suitable for beaver;
- it provides a range of terrestrial and freshwater habitats and species which can be evaluated
- natural containment is relatively good;
- it is a working forest, which will allow an assessment of beaver presence on forestry practices;
- there is one main owner, FCS;
- there is good access for field workers and visitors;
- local SNH and FCS offices are nearby;
- local people are generally supportive and interested (see details below);
- visitor facilities are already on site;
- visitor disturbance is likely to be low in the core part of trial site;
- Knapdale is a Special Area of Conservation (SAC) and therefore there may be opportunities to seek relevant European funding.

3.3 Release points

Three beaver families will be released in Knapdale at suitable release points that are adequately far apart to provide each colony with sufficient riparian habitat in its territory. This has to take into account the fact that beavers set up a territory that they will defend. Territory sizes vary depending on a number of variables but colony densities of 1.5, 0.5 and 0.1 colonies per km length have been estimated in good, quite good and mediocre beaver habitat in Europe. Based on published information and the views of Norwegian specialists who have seen the site, the quality of habitat at Knapdale is considered to be relatively good, but it remains to be seen what territory size the beavers establish. However RZSS will continually review the viability of this population and if necessary, augment with addition imported animals

The three initial release points are:

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

4 BUSINESS CASE

Following the consultation process the period of the trial following release of the beavers in Spring 2009 was increased from three to five years. For costing purposes the total length of the project including the preparatory work is six years starting April 2008. This has increased the total cost of the project from that envisaged initially.

The interpretation and communication content (which includes education) of the trial has also been increased following consultation as this was felt to be an important aspect of the reintroduction. Similarly monitoring of and research into the beaver (as opposed to the habitat) have been increased. These two activities have also increased the overall cost of the project during its development.

The cash cost of the project is approximately £850,000. At this stage a number of estimates of costs have had to be made and these are shown in Annex 2 Table A. The

project partners have assumed that monitoring of the environment is a statutory function and will be carried out by Scottish Natural Heritage (SNH). These estimated costs, which do not include SNH staff costs, are shown separately in Table B of Annex 2 and amount to £78,000. Should the licence be granted discussions will be held with SNH to quantify these costs more accurately.

The Licence applicants anticipate funding the cost of this project by fundraising from a wide range of sources. Initial soundings from a variety of foundations, trusts and other organisations indicate a high level of enthusiasm for this project. Mammals Trust (UK) (PTES) has indicated that it would be prepared to commit approximately £150k to the project.

5 PUBLIC HEALTH

5.1 Disease and water quality

Beavers, like all wild mammals, have the potential to transmit disease. They have been associated in the public press with the human water borne diseases caused by *Giardia* and *Cryptosporidium,* and the fish parasite *Gyrodactylus salaris*. The former two are already present in Scotland and are an issue in terms of public health whilst the latter is an issue for fisheries. It is difficult, of course, to assess to what extent, if any, beavers will pose an increased/additional risk to public health through the spread of disease as there is little information from Europe on this subject. However, the pathogens listed above will be sampled for during the course of the quarantine period of the beavers to ensure that the released animals are disease free.

The question of disease-free animals being infected after release to the wild obviously poses a question of whether their presence enhances transmission of disease above that usually encountered. For this reason, RZSS and SWT will be working in partnership with the Public Health Department of Argyll and Bute Council, (ABC), to ensure regular monitoring of the area as part of the regime of public health control. Sampling was conducted in 2001 and will be repeated prior to any approval to release of beavers in order to obtain baseline data for comparison. A range of pathogens will be tested for within this programme. The design of protocols for public health monitoring is being led by Argyll and Bute Council and a quote for this work is expected in due course.. In terms of any impacts on water quality and/or water supplies RZSS/SWT will be guided by advice from ABC and Scottish Water. During the course of the trial, water quality samples will also be analysed from appropriate control sites in order to detect whether contamination occurs in the absence of beavers.

The concern has also been raised that the introduction of beavers will result in the introduction of *G. salaris* to our native population of salmon. However, the advice received indicates that this is a parasite of fish which requires a fish host to survive. Beavers are considered to be only potential external carriers of the parasite (i.e. *G. salaris* does not parasitise beavers). Government precautions will be followed to ensure that any animals are free from the parasite before leaving quarantine. Subject to approval of this licence aplication, animals will be taken from a Norwegian population which is currently reported as being in an area free of *G. salaris.*

6 Impact

6.1 Environmental Education

The first UK beaver reintroduction offers a unique opportunity for both media interest in the progress of the beaver families in Knapdale and for environmental education programmes locally and via appropriate electronic media. The RZSS education programme has been developed and is delivered by a team of expert Education Officers. It has experience of teaching all age and ability groups, developing educational activities for zoo visitors, and of field work in the UK and abroad. In 2007 RZSS was awarded the prestigious Sandford Award, by the Heritage Education Trust in recognition of our commitment and expertise in education supporting our natural heritage.

Throughout the trial 'Bringing Beavers Back' a dedicated RZSS module aimed at schools will be conducted both at the living collections and through the national outreach programme.

One of SWT's principal objectives is to encourage people to see, learn and enjoy wildlife and to create opportunities for greater involvement in wildlife conservation. It has significant experience in informal and formal education programmes involving its extensive network of wildlife reserves, visitor centres, ,children's groups, local members centres, volunteers and a wide range of public events, publications and electronic media.

The Forestry Commission operates its Forest Education Initiative which also has the capacity to communicate the story of beavers in Scotland.

The scope for a new on-site visitor centre for interpreting beavers in Knapdale has been considered and offers an ideal platform for local interpretation and public engagement and as a hub for beaver-oriented wildlife tourism.

The project will have the opportunity to establish measures for understanding public opinion regarding the return of beavers as well as the general rehabilitation of Scotland's natural heritage. The re-establishment of a number of raptor species in Scotland has captured a sense of responsibility and ownership towards key habitats and species. The continuation of this process is paramount for the achievement of the 2030 Vision of the Scottish Biodiversity Strategy.

6.2 Socio-economic

One of the aims of the trial release is to determine the extent and impact of any increased tourism generated through the presence of beaver.

A recent report to the Wild Britain Initiative illustrates the potential positive socio-economic impact that beavers could have across the UK and is appended in Annex 6 to this application.

The Argyll and Bute Council has identified the following objectives in its Corporate Plan 2007-2011 and beyond:

Argyll and Bute: Leading Rural Area
Vibrant Communities

• safe supportive communities with positive culture and sense of pride in the area
• vibrant local economy that is based on core attributes of the area, flexible and open to new opportunities
• a sense of history with a view to the future
• high quality public services and leisure/community facilities that attract people to settle in Argyll and Bute

Outstanding Environment

• high quality environment that is valued, recognised and protected
• the environment is respected as a valued asset that can provide sustainable opportunities for business
• an area that is accessible, yet retains its remote character

Forward Looking

• communities that are culturally rich with a desire to excel
• proactive communities where local people and organisations look for and create opportunities
• partnership working across all sectors to coordinate developments, market Argyll and Bute and remove constraints that limit
possibilities
• communities that learn and use that knowledge

Tourism plays a major role in the local economy. There are significant opportunities to further develop tourism in Argyll and Bute, with an emphasis on the area as a 'quality destination' using the distinctive character of the area and key events to create higher quality jobs and to extend the tourism season

In the Scottish Executive strategy on tourism*: Scottish Tourism - The Next Decade* recognizes the importance of tourism as Scotland's biggest business – and emphasises the need for business entrepreneurship, product development and innovation. The wider Scottish tourism industry employs more than 200,000 people, contributes about £4.2 billion to the economy each year, and has ambitious plans for growth (a 50% increase in tourism revenue by 2015).

A recent study by Campbell et al (2007) suggest that the cost of damage caused by beavers in mainland Europe was rarely more than €10,000 per annum, per region. The study estimates that the potential revenue from beaver based wildlife tourism in Scotland alone would exceed £1.1million.

6.3 Biodiversity

Over the past decade Scotland has reinforced it's commitment to nature conservation through a series publications. In the 1997 document *Biodiversity in Scotland: The Way Forward*, produced by The Scottish Office, it states that 'The Government is committed to taking action in partnership with others to safeguard and where possible to enhance Scotland's biodiversity'. This commitment is further emphasised in Scottish Executive's 2001 policy statement *The Nature of Scotland* ; 'We are committed to sustainable development as part of all our policies, and a commitment to Scotland's biodiversity is an essential part of that'. Launched in 2004 The Scottish Biodiversity Strategy sets the stage for achieving a 2030 vision of Scotland as a world leader in biodiversity conservation. More recently the SNH Species Action Framework identifies the possible reintroduction of the European beaver as one of the priority actions for Scotland.

Beavers are a missing element of our native biodiversity and were lost due to human activities. Arguments have been proposed, therefore, that we have a moral

responsibility to consider their restoration. However, beavers are also important keystone species in forest and riparian ecosystems. Their role as waterway engineers - modifying their environment to make it more suitable for them to live in - has measurable benefits to other species. This is perhaps most significant through the creation of beaver ponds behind dams and through their foraging habits. Beaver ponds can act as sediment traps on rivers, help to reduce floods by increasing water storage, help to neutralise acid run-off, provide extra food and pools for fish, and create additional habitat for other aquatic wildlife. Their foraging behaviour can result in a coppiced woodland-type habitat in riparian areas, prevent the invasion by scrub of valuable wetlands and provide dead wood for invertebrates. Therefore if re-introduced they would have a beneficial effect on Scotland's wider biodiversity also. While no causal relationship was found, Elmeros et al (2003) reported an increase in otters following the successful reintroduction of beavers in Denmark.

7 PROJECT PLAN

7.1 Donor Country

7.1.1 Source population

The International Union for the Conservation of Nature (IUCN) has strict Guidelines on the reintroduction of species. The guidelines recommend that, as far as possible, the taxonomically closest population should be used in any re-introduction. SNH are following these guidelines, hence a report (Kitchener & Lynch, 2000) was commissioned to study the morphometric comparison of the skull of fossil British and extant European beavers, *Castor fiber*. The general conclusion of this study was that the skulls of Scandinavian beavers are the most morphologically similar to fossil British beavers.

A concern about using Scandinavian beavers for a re-introduction is that they are based on few founders from a Norwegian relict population and display low genetic diversity. However, researchers have not observed any problems in an intensively studied population in southern Norway that can be linked to low genetic diversity.

7.1.2 Environmental factors

Kitchener & Lynch (2000) recommended that it would 'perhaps be beneficial to select animals which survive in a similar climate with a similar selection of food plants and trees'. Telemark County, the proposed location of the source of beavers for the project, is in a relatively mild region of Norway and, although winter temperatures are lower than mid Argyll, it is anticipated that animals from this area will readily adapt. Beavers are highly opportunistic with respect to food plant choice would be able to utilise similar vegetation types in Scotland. Another advantage of using Scandinavian animals is that they will have adapted to a similar pattern of photoperiodism as found in Scotland.

7.1.3 Practical issues

Collection of donor stock will be done in conjunction with staff from Telemark College, Norwegian University of Science and Technology,. This offers a number of benefits:

- The participation of experienced and respected beaver ecologists
- The availability of animals which have a known life history. This may include the possibility of obtaining animals which are already implanted with radio transmitters

(subject to equipment compatibility), thus reducing such intervention at a later stage. Many of the animals will also be tagged externally (ear-tags);

- The opportunity to select animals from rivers known to be free of diseases, such as *Gyrodactylus salsii* and *Giardia*;
- There is a history of co-operation on re-introduction work between Norway and Scotland. Norway provided the donor stock of White-tailed Eagles for the successful Scottish re-introduction (1968, 1975 -1985 and subsequently).

The main issues which will arise with the use of Norwegian animals are the more complex importation requirements due to the non-EU status of Norway. However RZSS has extensive experience in the movement of animals throughout the wider European region and has already been granted a licence for the import of wild caught beaver from Norway.

7.2 Procurement of release animals

A minimum of three family groups of beavers will be removed from the donor population and transported during autumn 2008 and retained in quarantine for six months, with a view to a release in spring the following year.

Family units of beavers consist of four to six animals on average (an adult pair, and up to two or three offspring of the current year and one or two offspring of the previous year). This would result in the capture of up to about 18 animals .

There is inevitably some risk that during the quarantine period there may be some animal mortality. RZSS and SWT, after consultation with relevant specialists, would consider not releasing any family to Knapdale which loses one or both adults during the quarantine period (the surviving animals from these families would instead have to be returned to the donor country or housed in a collection). Norwegian researchers currently use hand-netting as their preferred means of capturing animals. This is considered to be an efficient and safe means of obtaining target animals whilst they are fully visible (thereby minimising capture stress and risk). The use of targeted hand-netting may, however, incur additional time and expense to ensure the capture of whole family units. All efforts will be made to ensure whole family units are collected.

7.3 Quarantine

The importation of beavers falls under the Rabies (importation of Cats, Dogs and Other Mammals) Order 1974 (as amended). Consequently imported animals would be subject to statutory containment in approved quarantine facilities for a period of six months.

Prior to departure from country of origin all release animals will have undergone appropriate health screening to reduce substantially the risk of carriage of animal borne disease or the transportation of animals in suboptimal health. An appropriate quarantine facility has been identified.

7.4 Release

Prior to release all animals will be fitted with a number of identifying and tracking features. Each beaver will have numbered ear tags, radio-tags fitted to the tail and subcutaneous microchip responders should external tags fail or be lost. Two options are available for the release of animals: ‘hard release’ or ‘soft release’. ‘Hard release’ involves the direct release of animals to the wild from the transit cages. It presents a more cost-effective method of release but has the potential to expose the animals to

greater stress, and thereby possibly enhanced susceptibility to disease and mortality factors. 'Soft release' involves the use of artificial lodge structures to provide shelter for released animals. Whilst this is a more expensive and time-consuming method, it provides the potential to i) reduce stress to the animals by providing instant shelter and ii) reduce the need for animals to seek out shelter iii) reduce the risk of animals moving away from the specific re-introduction loch site.

The project will implement both soft and hard release approaches and take the opportunity to compare the efficacy of both methods at different release points.

7.5 Beaver Management

7.5.1 Containment options

It is important to reiterate that this application is for a licence to conduct a trial release of beavers in Knapdale. As such, the requirement for appropriate project staff on the ground is paramount. There will be adequate project staff based in Argyll to conduct the day to day management of the trial and to respond to emergent needs as they occur. Additional support staff will be available from both SWT and RZSS should interventions occur such as the capture of beavers moving outwith the release site.

The primary aim of the trial is to establish, for study, a population of beavers within an agreed study site. However, as the beaver is a mobile species, there can be no guarantee (despite the provision of artificial lodges) that they will remain faithful to this particular site on release. Consequently provision is in place for deliberate containment of the animals.

Several methods are available by which the movement of released animals may be restricted (see below). Each of these methods presents some risk of animals escaping from the site undetected. Consequently, it must be recognised that there is no absolutely assured method of confining the animals. In accepting this principle, a priority of the trial is to ensure sufficient staff and resources are available to enable efficient monitoring of each of the animals following release both within and immediately surrounding the trial site.

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There are three main approaches to containing released animals:

- physical barriers, e.g. fencing,
- habitat manipulation or
- capture and removal of animals straying beyond the accepted boundaries of the study.

Given the size of site which is required to investigate the characteristics of dispersal, it is unlikely that the integrity of a fence of sufficient length could be maintained at the standard required for containment. Nor is it desirable given that the primary purpose of the trial is to study beavers in the wild. Thus, whilst fencing may be suitable for fencing particular outflows of the release lochs initially and for small areas for other management reasons, this is not a viable option to restrict animal movement over, or from, the whole study site.

Habitat manipulation to deter/attract beavers along preferred routes has also been considered. However, given the capacity of the species to modify its environment to suit its needs, such an approach is likely to be costly and meet with limited success. Consideration should be given to investigating this method as a tool in long-term

management, but it cannot be relied upon as a sole method of containment.

The third option, for the identification and removal of animals straying beyond the agreed boundaries of the study, although expensive, is potentially the most reliable and efficient method of containment available. This is the option which will be used at Knapdale. All the released adult animals will be radio tagged individually for the purpose of identification and tracking, which will significantly increase the likelihood of detecting individual movements over an extended period of time (consideration is also being given to the use of remote data logging equipment capable of storing data from a number of antennae simultaneously).

7.5.2 Movement of animals outwith the trial area

The likelihood of individual detection by this method is particularly feasible given the limited number of animals which are required for the trial study.

It is still very likely that some animals will try to move outwith the trial area. The released animals will be radio-tagged and so any such movements should be detected, whereupon they will be trapped and retrieved. However, due to the possibility of tags failing, or young animals dispersing prior to being tagged, the possibility of un-tagged animals moving beyond the area must be considered. The tendency of the animals to remain close to the water and leave obvious feeding and engineering signs will assist with finding animals outwith the agreed boundary. In such cases, it is anticipated that the individual beavers would be reported to SNH within a relatively short period, aided by liaison with adjacent land owners and managers e.g. farmers, British Waterways staff (who manage Crinan Canal north of Knapdale), anglers, FCS staff, etc. Training in beaver ecology and behaviour will be offered at a local level by SWT and RZSS early on within the trial, in order to assist local landowners and managers recognise beaver field signs.

Whilst every effort will be made to contain the animals within the study area, provision will be made for the rapid and efficient removal of animals straying outwith the trial area. This will be implemented where animals take up residence in an area against the wishes of the landowner, or are considered to be causing unacceptable levels of damage.

Beaver trapping techniques have been well tested on the Continent. The safest and most efficient techniques are netting and the use of a cage-type trap. The latter has been developed by beaver specialists in Germany and is based on traps used for foxes and badgers. It can be used on land or in shallow water, is easy to set, and does not harm the animals or people. A similar system was deployed successfully by RZSS to retrieve a beaver found to be at large in Perthshire in August 2007.

Netting techniques have been developed in Norway. This involves the use of hand held nets used from boats or on land to trap the beavers. Netting is generally undertaken at night and spotlights used to locate the animals. This, too, has been found to be an effective technique, particularly in lochs and large river systems.

Trapping will be by the use of live-traps set on beaver runs. Trapped beavers will be returned to the trial area. It is anticipated that most animals will be returned to the location from which they strayed. However, in the case of unidentified animals (see above), suitable sites will be sought within the study area for re-release. Radio-tags will be checked, or fitted to untagged animals, to investigate the incidence of repeat

offenders.

Movement of such animals will take into account the social nature of the species and, therefore, the need for integration into existing areas or social groups. Alternatively they may be housed in a collection (previous agreement will be sought with the host quarantine facility to house a maximum number of straying animals). Under circumstances where these options are not available, the animals will have to be humanely destroyed (see below).

Whatever situation arises a holding enclosure will be made available by RZSS for transfer of animals from the trial to the captivity site.

The situation may arise when trapping is either unsuitable or unsuccessful for the removal of beavers from outwith the trial site. In this situation, animals will be darted or shot (experience from mainland Europe indicates that beavers are easy to control in this way). Shooting would be used as a last resort for any 'untrappable' beavers, where a landowner/manager requests rapid removal of the animal (and the conditions preclude trapping as an efficient means), or where no other way is identified of dealing with the situation.

7.6 Exit strategy

An exit strategy is an integral part of the project plan, although the Steering Group firmly believe that this will be a successful project. This may be implemented either during the trial if major insurmountable problems occur, or at the end of the trial. The reasons for considering implementation of an exit strategy are as follows:

1. Unsustainable and detrimental effects arise as a result of the re-introduction of beavers to the trial area;

2. There is an insupportable level of mortality in released animals as a result of persecution, human intervention or natural mortality attributed to trial procedures;

3. The security of the site is compromised to the serious detriment of the animals.

These criteria apply equally to forestry, agriculture, fishery, archaeological or conservation interests, as well as presenting options for implementation of an exit strategy where there appears to be serious risk to the health or status of released animals or their progeny.

There are four options described below:

Option 1: Repatriation of animals to the country of origin/transfer to other re-introduction programmes.

Option 2: Housing of animals in zoological collections

Option 3: Capturing, neutering and returning animals to live their life span in the wild.

Option 4: Humane control of animals

Methods of humane control are well known and the option would require the collection, or hunting, of all known animals for destruction.

Although relatively easy to implement, the ethical issues surrounding the control of animals introduced for the purpose of a scientific experiment need to be considered carefully.

7.7 Research and monitoring strategy

The research and monitoring programme has four main objectives:

- To determine the impact of beavers on the natural landscape and ecological components of the release site including mink;
- To ensure that any success or failure of the trial is measurable;
- To provide data for the purpose of informing a predictive model of any subsequent expansion of the trial or full nationwide beaver reintroduction.
- To contribute to our understanding of beaver biology
- To determine the socio-economic impact of the beavers in the local area through its contribution to tourism, employment etc

Upon granting of the licence and in conjunction with SNH, the initial priority for the research programme will be to establish baseline data on the main biotic indicators as described in sections 7.7.4 to 7.7.7.

With regard to the designated status of the Knapdale area, all bar one of the notified features of the SSSI and SAC have already had baseline Site Condition Monitoring carried out on them by SNH within the past five years.

An effective monitoring programme is imperative to ensure that sufficient and appropriate information is collated during the trial to underpin an informed decision on the feasibility and viability of restoring a widespread population of beavers to Scotland. Moreover, in order to ensure that the monitoring programme is effective, a protocol will be in place prior to the release of any animals to the study area.

Regular measurements will be made on the health and status of the beaver population, their behaviour and changes to environmental conditions locally both prior to and following the release of beavers. Subsequent comparison of this information will identify changes to local landscapes which may be attributed to specific aspects of beaver occupation or behaviour.

The use of GIS will play an important role throughout the whole project in the interrogation, analysis and presentation of data. Initially all existing survey information will be collated and, where appropriate, placed on GIS. The identification of release sites and habitat suitability has employed the use of GIS in a recent study in Austria (Maringer & Slotta Bachmyer 2006).

A paper entitled ‘Trial Re-Introduction Of The European Beaver To Scotland: Scientific Issues’ was submitted to SNH’s Scientific Advisory Committee (SAC) for consideration. A review of the findings of this paper is required

The presence of beavers in Scotland will also provide the opportunity to extend studies

into aspects of beaver biology such as selective foraging (Haarberg & Rosell 2006), territorial scent marking (Rosell & Thomsen 2006), (Rosell & Sander 2006), (Kaltenegger D, 2003), territory and group size (Campbell et al 2005), space use and movement patterns (Herr & Rosell 2004)

7.7.1 Animal Health

The Beaver Project Team will be responsible for the health and welfare of the released animals and their progeny throughout the trial. Wherever possible, remote, non-invasive techniques will be used to assess the health status of individuals. Analysis of faecal material will provide information on gut parasite burden and cortisol as a measure of stress. Similar research will be conducted in Norway to provide comparative benchmarking data.

Individual release animals will be recaptured on an annual basis in order to assess overall body condition, external parasite load, dentition and the measurement of blood parameters.

7.7.2 Beaver ecology

Individual adult animals will be tagged, for the purpose of tracking and identification. Information on their health and status will be collected at regular intervals. The following parameters will be measured:

- Survival;
- Breeding success/fecundity;
- Distribution/dispersal;
- Interactions with other species.
- Understanding the biology of beavers.

Measurements of these elements will be made using field observations. Tagging of new individuals will require trapping and handling at suitable periods. In addition, the information collated through practical observations and surveys will provide a dataset which may be used to refine the accuracy of the initial predictive population model.
The distribution and habitat use by beavers will be monitored, providing information on

- Feeding areas;
- Types of food;
- Use of burrows and lodges.

As well as observing the impact of beavers on land use, measurements will be made to ascertain the impact of such activities on beavers, e.g. forestry practice and angling activities.

7.7.3 British Waterways

Close liaison with British Waterways staff will be a key part of the project in order to identify potential problems at an early stage. Potentially vulnerable sites, e.g. supply lochs and inflow/outflow burns, will be checked on a regular basis by project staff, and there will also be regular liaison with British Waterways staff.

7.7.4 Damming behaviour

In order to gauge the impacts of any dams built, it will be necessary to measure the frequency of construction and maintenance of beaver dams. Consequently, the following will be investigated during the course of the trial period:

- frequency of dam construction;
- seasonality of dam construction;
- method and dimensions of dam construction;
- the relative stability (longevity) of dams;
- the potential for major sediment pulses and downstream erosion as a result of single or multiple dam failures.
- effect of dam building on surrounding habitat (e.g. tree removal, flooding impacts)
- the efficacy of management removal of dams as a means controlling undesired dam locations

Measurement of these elements will be carried out primarily through direct, non-invasive observations. Information on dam construction will be associated with habitat information (see below) to determine any characteristics commonly attributable to siting or construction of dams.

7.7.5 Terrestrial and aquatic habitats

As well as monitoring the success/failure of the establishment of the beaver population, information will be collated at regular intervals from which to assess the ecological effects of beaver occupation locally. This will be measured on two scales; changes within the core range of beaver colonies, and gross changes at the level of the study site.

Terrestrial vegetation surveys will be undertaken in the riparian areas, and more detailed information will be collected on the distribution and abundance of tree species which beavers may use for food or engineering purposes. Detailed habitat maps prepared prior to the release of beavers will be used to record changes to the landscape during the course of the study. These will take into account any seasonal effects or trends in foraging behaviour noted throughout the course of the trial period (tracking changes through release and establishment phases). Existing information is currently being collated and new surveys are planned for spring 2008.

Parallel to the early stages of the proposed trial a separate activity is to be conducted under the obligations of the EU Water Framework Directive. Across Scotland, and specifically Argyll, River Basin Management Plans are to be drafted and subjected to consultation. The information generated through the monitoring of the beaver trial reintroduction will inform and make reference to the RBMP process and objectives.

A co-ordinated programme of work to effectively monitor the aquatic and semi-aquatic habitat over the trial period will be developed by April 2008. This will include the development of methods for monitoring aquatic/semi-aquatic macrophytes, water chemistry/quality and freshwater invertebrates at Knapdale during the trial period which will contribute towards an assessment of the effect of the beaver re-introduction to Knapdale. The programme will ensure the monitoring of these aquatic features is done in an integrated and cost-effective manner and that they link to other monitoring studies being undertaken at Knapdale as part of the beaver project. An initial baseline survey

for aquatic macrophytes will be undertaken in summer 2008.

Physical 'in-river' and loch habitat parameters will also be measured. Primarily these will address:

- levels of sediment transport along the water course;
- the source of sediment stored/accumulated within beaver ponds;
- any changes in water level locally;
- the stability of banks occupied by beavers;
- alterations to the watercourse network attributable to the creation of beaver canals or re-routing existing watercourses;

7.7.6 Features of conservation interest

Baseline monitoring of the resident otter population will begin prior to the release of beaver. Otters are valued by the local community and the effect of beavers on the otter population was raised as a concern during the local consultation.

The Beaver Steering Group is aware of the current presence of American mink within the Knapdale area and will be investigating ways in which additional mink control can be facilitated through delivery and management of the beaver trial.

The proposed trial area contains part of the Taynish and Knapdale SAC and entire the Knapdale Woods SSSI. All features of the SAC and SSSI are subject to Site Condition Monitoring by SNH and the continuation of this process during and after the trial period will be vital in order to evaluate the impact of the beavers upon these important habitats and species. RZSS and SWT will work closely with SNH and FCS to ensure that such monitoring is delivered during the trial period.

Otter, *Lutra lutra* are an Annex II species identified within the Taynish and Knapdale Woods SAC. They are also highly valued by the local community and the effect of beavers on the otter population was raised as a concern during the local consultation. As part of SNH's Site Condition Monitoring process, a baseline survey of the resident otter population was last undertaken in 2005, when the population (which is mostly associated with the coast around Loch Sween, rather than within the freshwater bodies of the proposed trial area) was found to be in favourable condition. It will be necessary to ensure that the otter population is monitored during and after the trial period. The non-native mink is also a species present in the area and its detrimental impact upon native species is of great local concern. It is advisable to ensure that mink are monitored at the same time as the local otter population.

Marsh fritillary butterfly, *Euphydryas aurinia* is another Annex II species identified within the Taynish and Knapdale Woods SAC. The species was last surveyed in 2006 under Site Condition Monitoring requirements, when it was found to be in favourable condition. The majority of the local population is found outwith the trial area, in the Taynish NNR, but a small population is found in the heart of the trial area around Barnluasgan. It will be necessary to monitor this species during and after the trial.

The site is notified as an SSSI for its dragonfly interest, particularly for Hairy Dragonfly, *Brachytron pratense* and Beautiful Demoiselle, *Calopteryx virgo*. It is predicted that both species may benefit from the activities of beavers, such as the opening up of riparian areas and the increase in availability of dead vegetation for egg laying. Site Condition Monitoring of the dragonfly assemblage was last carried out in 2003, when

the feature was recorded in favourable status. The monitoring of dragonfly species will also be undertaken within the trial period, again in co-ordination with Site Condition Monitoring requirements.

7.7.7 Archaeological features

The Scheduled Ancient Monuments within the trial area already have an inspection regime in place as agreed in the relevant SAM Management Plans, and FCS and Historic Scotland staff will continue with this monitored programme with any additional impacts related to beaver activity recorded and if necessary acted upon.

7.7.8 Land uses

One of the key aims of the trial is to investigate the potential effect of beaver occupation on the landscape and current land uses. Knapdale will provide an excellent opportunity to examine beavers alongside ongoing forest management. It will include effects on infrastructure such as culverts, roads and ditches. Knapdale also has some small areas of rough grazing land within private land holding which could perhaps allow some examination of how they utilise this land use type. Land use information will be mapped prior to the release of beavers.

Biotic factors which influence freshwater loch fisheries will be monitored at Knapdale. Consequently, research on these topics will provide a basis for developing an understanding of the impact of beavers on water bodies, for example the change in water conditions around a beaver dam. It could be argued, however, that this research will be conducted largely on static water systems and, as such, will have limited applicability to flowing systems, such as salmonid rivers.

7.8 Risk Assessment

The detailed risk assessment document is provided in Annex 6

7.8.1 Potential damage to agriculture

Given the limited number of burns within and adjacent to the trial area, it is anticipated that flooding would be unlikely to present a major problem. However, monitoring of vulnerable sites should allow the early detection of dam building behaviour and/or the identification of offending animals. Flooding effects can be tempered by the use of pipes although experience from the Continent suggests that this only delays the problem as beavers may construct another dam adjacent to this.

Feeding on crops is only likely to occur when they are within close vicinity of freshwater (20-60 metres). . Feeding on agricultural crops is unlikely to be a problem given that within Knapdale, there is a very low level of agricultural crop occurrence compared with a wide range of wild food plants in or adjacent to water.

7.8.2 Potential damage to forestry and woodland

The flooding of forestry land is not anticipated to present a significant problem given the hilly terrain of the trial site and the limited number of burns within and adjacent to the trial area. Also, the same principles of early detection apply as above. FCS staff will

also be present within the trial site to assist project staff in the early detection of potential problems.

It is not anticipated from experience elsewhere that there will be much, if any, direct damage to the commercial conifers of Knapdale Forest.

Monitoring of riparian and other broadleaves will be carried out in the trial area as part of the project and if unacceptable damage occurs remedial action will be taken which could include removal of offending beavers and/or fencing of vulnerable areas.
A recent study of the impact of reintroduced beavers in Croatia suggested that 75% of young pedunculate oaks(*Quercus robur*) were undamaged (Margaletic 2006)
Liaison will be maintained with neighbouring land managers to detect flooding and tree damage at an early stage.

7.8.3 Fishing interests

Liaison with the local angling club which has a lease on most of the trial lochs will be an ongoing part of the project and should help to identify any problems at an early stage. To date some fishing licences have not been reissued by FCS and therefore impact on fishing interests has already been reduced. In addition the anglers have other sites in the local area, outwith the trial site, and will be able to report any signs of straying beavers. Due to the local habitat characteristics the trial release in Knapdale will not provide sufficient data on the impact of beavers and their activities on salmon fisheries. This investigation will need to be considered when selecting a second release site in phase II of the project. However, as part of stakeholder liaison organisations responsible for local fisheries interests will be invited to take part in the Knapdale Beaver Forum.

7.8.4 Water supplies

Private water supplies that might be at risk from dams, e.g. burn supplies, will be regularly checked by project staff and dams and offending beavers which may set up residence in these burns will be removed. Any problems in water quality or pathogens will be detected via the monitoring carried out for RZSS by Argyll and Bute Council, and necessary remedial action taken on their advice.

7.8.5 Health and Safety of project personnel

Project partners have a responsibility to secure the health and safety of all staff and others who may be affected by its operations. This includes project staff and volunteers working on the project.

FCS as the landlord will place certain responsibilities upon the Project Partnership as tenant. Equally FCS will have responsibilities as landlord to the Project Partnership and other tenants, contractors and the public. These arrangements will be vested in the lease to be drawn up between the partnership organisations.

All field staff and volunteers will be provided with full training on specific methods which should be adhered to, to ensure safe working conditions for all staff. This will include

methods of handling animals safe access in riparian environments, dealing with conflict. Protective equipment, including radio equipment, will be provided to those working in the field.

7.9 Criteria for success/failure

During the trial, information will be collated, both on the scientific and socio-economic implications of the trial, and presented for consideration by the Beaver Steering Group at the end of the trial period. This information, and the views of the Groups, will subsequently be presented to Scottish Government for consideration on whether the trial has been successful or demonstrated limitations. Then SNH will make a recommendation over future action and consult external parties and the Scottish Government to agree the way forward.

Criteria for success:

- Survival of introduced animals is similar to successful re-introduction programmes elsewhere in Europe at similar period of population establishment.
- A stable or increasing core population is achieved within the limits of the study site.
- The beaver population demonstrates a positive contribution to ecosystem function
- Beaver re-introduction is integrated with habitat management/restoration.
- The impact on the economy of the area as a result of the presence of beavers is positive

Criteria for failure:

- Mortality levels preclude establishment of a population.
- Significant and unsustainable damage is incurred by the ecosystem within the study site.
- The area suffers significant economic loss as a result of beaver activities
- Costs of project/damage/management significantly exceed expectations

7.10 Project management structure

Principle Applicants
RZSS, SWT

The Beaver Steering Group:
Members include RZSS, SWT, SNH, FCS and independent experts
Purpose: To advise the project team, to provide direction and support, and to co-ordinate all activities concerned with the success of the enterprise. To report every six months to Scottish Government on project progress.

The Beaver Project Team
Purpose: To implement the project on the ground including import and quarantine, release and monitoring of beavers, production of newsletter and to lead on local environmental education. To report each month to the Beaver Steering Group on project implementation progress.

7.11 Staffing

Project staff will be provided by both SWT and RZSS with recruitment of additional personnel as required.

8 TIMESCALE

- Autumn 2008 – beavers captured and brought to UK for quarantine
- Spring 2009 – beavers released at Knapdale.
- 2009 - 2013 – continuous monitoring and evaluation of trial by RZSS an SWT, in consultation with other appropriate parties and production of report for consideration by Scottish Government
- Spring 2010 - feasibility study begins on possible second release site for phase II of beaver reintroduction
- 2012 - if granted second release of beaver at new location
- 2014 - decision on beavers in trial area

9 COSTS

Because the project is a trial release, it will necessarily have a higher than normal cost because of the intensive monitoring and management intervention requirement.

The project budget takes into account the following cost centres:

Site preparation

Beaver capture, transport and quarantine

Project management

Education/Interpretation

Monitoring

A full project budget is provided in Annex 2

10 CONCLUSION

RZSS and SWT consider that a scientific trial at Knapdale is the appropriate way to proceed to help determine the suitability of the re-introduction of beavers to Scotland. The proposed trial incorporates adequate safeguards for the natural and cultural heritage and land and water interests and its scientific approach will provide sound information to help guide future decisions. RZSS and SWT requests that Government grants a licence for the trial release of European beaver into the wild in Scotland at Knapdale, Argyll, under Section 16(4) of the Wildlife and Countryside Act 1981 as amended.

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ANNEXES

Annex 1 Map of Knapdale Trial Area

Annex 2 Business Case and Finance Spreadsheet

Annex 3 SNH Response to the Minister's letter of 20 December 2002

Annex 4 SWT report on the local consultation Oct/Nov 2007

Annex 5 Economic Impacts of the beaver, Report for Wild Britain Initiative (2007)

Annex 6 Risk assessment