



BISON REWILDING PLAN 2014–2024

Rewilding Europe's contribution to
the comeback of the European bison

ADVISED BY THE ZOOLOGICAL SOCIETY OF LONDON

Rewilding
Europe®



REWILDING EUROPE

BISON REWILDING PLAN, 2014–2024

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ABOUT REWILDING EUROPE

Founded in 2011, Rewilding Europe (RE) wants to make Europe a wilder place, with much more space for wildlife, wilderness and natural processes, by bringing back a variety of wildlife for all to enjoy and exploring new ways for people to earn a fair living from the wild. RE aims to rewild one million hectares of land by 2022, creating 10 magnificent wildlife and wilderness areas, which together reflect a wide selection of European regions and ecosystems, flora and fauna. Further information: www.rewildingeurope.com



ABOUT ZSL

Founded in 1826, the Zoological Society of London (ZSL) is an international scientific, conservation and educational charity whose vision is a world where animals are valued, and their conservation assured. Our mission, to promote and achieve the worldwide conservation of animals and their habitats, is realised through our groundbreaking science, our active conservation projects in more than 50 countries and our two Zoos, ZSL London Zoo and ZSL Whipsnade Zoo. Further information: www.zsl.org

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FOREWORD

A symbol for Europe

There is no species that better symbolises the state of nature conservation in Europe than the European bison. Nearly extinct in the last century, it was rescued by passionate conservationists from the last animals in captivity, and although it is now benefiting from a growing environmental awareness, the European bison is still not out of danger and remains virtually unknown to the general public. There are fewer individuals of our largest European land mammal in the wild than there are black rhino in Africa!

Europe is at a turning point in its history. For the first time in many centuries people are withdrawing from rural areas; young people are leaving the countryside and seeking their future in cities or coastal areas. In addition, a stronger legislative framework, dedicated species protection programmes, a large protected areas network across the continent and a growing public interest in wildlife, are the main drivers behind a spectacular wildlife comeback that is taking place on our continent. A report published in 2013 by the Zoological Society of London, European Bird Census Council and BirdLife International demonstrated this phenomenon for selected, often iconic, and keystone species in our ecosystems.

However, most species are recovering from an all-time low in the first half of the 20th century (for some species even earlier), and are still far from their potential natural numbers or distribution. From a historical perspective, this wildlife comeback in Europe has just begun, and there is a long way to go to ensure that some of these species have a long-term future on our continent.

The European bison is a clear example of this phenomenon; we therefore need a continued and strong effort to build viable populations of this species to ultimately down-list it on the IUCN Red List where it still has a 'Vulnerable' status.

With this Bison Rewilding Plan, Rewilding Europe demonstrates its planned contribution to the conservation of the European bison. In 10 years time, we aim to establish five new, free roaming and completely wild-living bison populations, each comprising at least 100 animals. In one area (the Carpathians) we will work towards a meta-population of at least 500 animals by 2025. In addition, our approach aims to ensure that the return of the European bison is embedded in the socio-economic context and perspective of the areas concerned. The local economy of an area can benefit tremendously from the comeback of this iconic species in addition to the natural environment.

With a vast protected area network, Natura 2000 and Emerald networks, there seem to be ample possibilities for building viable meta-populations for the species in Europe.

Thanks to the work of the European Bison Conservation Centre, IUCN, European zoos and many other organizations, institutions and individuals, the bison is preserved in Europe. In collaboration with these parties and using the new tools that are at our disposal, Rewilding Europe wants to help bring the European bison out of the danger zone, raise awareness of the species in the general public and welcome this fantastic animal back to as a familiar inhabitant of Europe's natural landscape once more.



Frans Schepers

A handwritten signature in black ink that reads "Frans Schepers".

Managing Director
Rewilding Europe

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EXECUTIVE SUMMARY

The European bison, the largest terrestrial mammal in Europe, became extinct in the wild in the early 20th century, but was brought back from the brink through reintroductions of (semi-) wild-living populations across Central and Eastern Europe. Despite successful conservation actions for this species, European bison conservation still lacks an internationally coordinated hands-on approach and reintroductions continue to rely mostly on local initiatives. Yet many opportunities exist for conservation efforts, since in many regions of rural Europe, large areas of land are becoming abandoned and Europe has a huge network of protected areas with good bison habitat, including Natura 2000 and Emerald Networks.

The European bison is currently listed on the IUCN Red List of Threatened Species as *Vulnerable* due to its small population size, with its two distinct breeding lines listed as *Vulnerable* (Lowland line) and *Endangered* (Lowland-Caucasian line), respectively. The species is currently primarily threatened due to insufficient habitat, small population size, disease and low acceptance by people in some areas. Improving the status of the species requires combating these threats as well as effective conservation management which takes into account the biology and ecology of the species, such as group composition and behaviour, feeding ecology, ecological niche, reproduction, as well as genetics.

Apart from its important ecological role in European nature, Rewilding Europe believes that

European bison can make a positive change for rural development in the remote corners of Europe experiencing land abandonment, and has chosen the bison as one of the flagship species for its rewilding activities. This document presents the guiding principles and specific actions proposed by Rewilding Europe to contribute to bison conservation in Europe within this initiative, and draws on the best available knowledge on bison biology and ecology, and lessons learned from previous and ongoing reintroduction efforts across Europe.

This Bison Rewilding Plan 2014–2024 describes Rewilding Europe's vision of achieving its goal of viable populations of free-ranging herds of bison being established and restored across Europe and integrated into Europe's landscapes alongside human populations. A vision which will enable the long-term conservation status of the species to be improved across Europe.

Specific objectives are set out to achieve the two vital goals in European bison conservation: a) to establish viable and self-sustaining populations of bison across Europe in rewilded and connected habitat and b) to achieve long-term protection and support for free-ranging European bison by means of improved legislation, community outreach, education and the establishment of wildlife tourism; thus creating economic development as well as establishing large wild landscapes in those areas of Europe which are currently suffering land abandonment and economic stagnation.



1. INTRODUCTION

EUROPEAN BISON CONSERVATION: THE CHALLENGE

1.1

The European bison is Europe's largest native terrestrial mammal. It became extinct in the wild in 1927 but successful conservation efforts have seen the species recover due to the introductions of (semi-) wild-living populations across Central and Eastern Europe. However, its global conservation status remains 'Vulnerable' on the IUCN Red List of Threatened Species, partly on the basis of small population size, and further action is required to restore viable, healthy and self-sustaining populations across Europe.

The IUCN Status Survey and Conservation Action Plan (Pucek *et al.* 2004) outlined the agreed actions needed to improve the status of European bison, primarily focussing on continuing captive breeding efforts and reintroductions. Since its publication, several bison reintroductions have been made and an international network of interested parties and bison specialists has been developed, first through the Large Herbivore Foundation, and subsequently through the European Bison Conservation Centre (EBCC). However, many of the recommendations from the action plan have still not been sufficiently implemented 10 years later and impetus is lacking to push the species out of the danger zone. Population growth remains slow and populations are fragmented. Only two recent projects (Vanatori Neamt Nature Park, Romania and Western Pomerania, Poland) have the potential to grow to a population of over 100 individuals in the next 10 years; Western Pomerania already has two sub-populations of 78 (Miroslawiec herd) and around 54 (Drawsko herd) individuals (unpublished

data, Zachodniopomorskie Towarzystwo Przyrodnicze). Most reintroductions lack the opportunity or ambition to establish large metapopulations of (at least) many hundreds of animals. In some areas culling is even used to keep populations within numbers accepted by farmers and foresters. Densities of European bison in the landscape are therefore falling short of what is needed to significantly improve its conservation status and to restore its ecological role in wider ecosystems, exacerbated by intensive management.

Despite the fact that the EBCC has taken on a coordination role, European bison conservation still lacks an internationally coordinated hands-on approach and reintroductions continue to rely mostly on local initiatives. Governments within the range states of European bison have also so far failed to take adequate action to improve the status of the species or develop nationwide action plans, with the exception of Russia, Poland and Romania, who have written a national conservation strategy for the European bison (in 2002, 2007 and 2008 respectively). This is despite its inclusion in a number of legislative instruments, for example in the European Union's Habitat Directive (as a priority species in Appendix II and IV) and the Council of Europe's Bern Convention on the conservation of European wildlife and natural habitats (Appendix III).

European bison remains an enigmatic and largely unknown species to most people in Europe and due to lack of awareness it does not receive the public, institutional or financial support that it requires.



1.2 EUROPEAN LANDSCAPES: THE OPPORTUNITY

In many regions in rural Europe large areas of land are becoming abandoned. The current trend is towards city growth and intensification of farming and forestry in the most fertile areas. Extensive farming and pastoral livelihoods are no longer economically viable and many young people are leaving the countryside, changing the demographic make-up of many areas. Local economies are subsequently being depressed in many rural regions.

EU subsidies to farmers also mean that fields in many regions are kept open for cutting hay, despite the hay not being used and left to rot. Every year about one million hectares of land are left fallow within the EU (IEEP 2010). This is not only a disadvantageous situation economically, but also leaves

large areas depleted socially and ecologically. Thereby it is important to note that the protected areas network in Europe (including Natura 2000 and Emerald Network) is one of the most extensive in the world, which provides a huge opportunity for the bison.

There is therefore a space – ecological, social and economic – for new initiatives to step in and create opportunities for conservation, restoration of land and re-building of local economies. Besides that, bison can profit from the growing network of protected areas in Europe, in particular the Natura 2000 Network and the Emerald Network (EEA 2013). Rewilding Europe has a particular interest in establishing rewilding areas across Europe and reintroducing regionally extinct species, using



European bison as one of the flagship species with which to achieve this objective. The aim is to enable ecosystems to recover and flourish once more without intensive management, and moreover to use this initiative to create economic opportunities in rural areas through ecotourism and (other) related business developments. Rewilding Europe recognises that the key to long-term, sustainable land use in Europe is not only a vision that benefits wildlife but also one that supports people.

Rewilding Europe is convinced that the European bison can make a positive change for rural development in the remote corners of Europe experiencing land abandonment, and has chosen the bison as one of the flagship species for rewilding. In this rewilding plan we present:

1. Relevant background on European bison, including its ecology and current conservation status.
2. Rewilding Europe's guiding principles on bison conservation, encompassing current knowledge on bison, bison management and social and economic factors affecting potential bison areas.
3. Rewilding Europe's strategy on bison conservation in Europe, including a detailed rewilding plan of immediate, mid-term and long-term actions to help improve the European bison's conservation status, and to create viable and healthy populations across Europe.

Abandoned grazing lands in the Velebit mountains, Croatia



2. EUROPEAN BISON

TAXONOMY AND PAST DISTRIBUTION

2.1

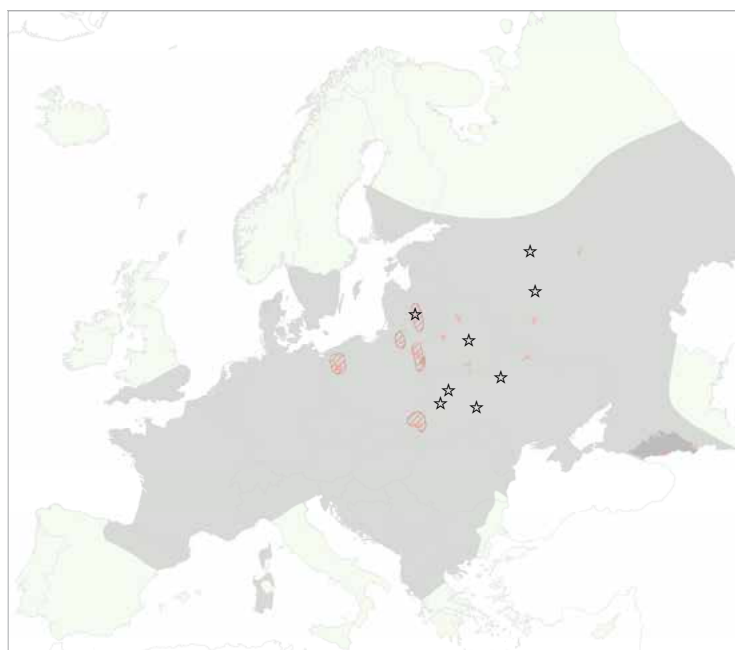
The European bison, *Bison bonasus* (Linnaeus 1758), belongs to the genus *Bison*, which first appeared in Central Asia during the Late Pliocene-Early Pleistocene and eventually spread across Eurasia and the Bering Straits into North America (Verkaar *et al.* 2004). This genus includes the extant American bison, *B. bison* (Linnaeus 1758), and a number of extinct species including ancestors of *B. bonasus*. Although much of the history of bison evolution remains unclear, current evidence suggests that the longhorn steppe bison, *B. priscus*, appeared around the Early Pleistocene and was widely distributed throughout the temperate zones of Asia and Europe (Benecke 2005), featuring heavily in Late Pleistocene European cave art. There is also some indication of a second species of bison outside Europe during the Late Pleistocene that was distinct from *B. priscus* and a sister taxa to *B. bonasus* but this research is still ongoing (Dr. Alan Cooper and Dr. Julien Soubrier, personal communication, 19 February 2014). Following the end of the ice age glaciation, the steppe bison disappeared and was replaced in Europe by the more diminutive short-horned European bison, *B. bonasus*. The ancestry of *B. bonasus* has still not been resolved; however, this ecological transition from a larger, cold-adapted form of bison to a smaller, temperate form is consistent with Bergmann's rule (Bergmann 1847). There are only two extant species of bison, the European and American bison. They share several morphological characteristics and can breed to produce fertile offspring. Genetic research indicates a close association between the two species (Verkaar *et al.* 2004). However, on the basis of distinct morphotypes and disjunctive distributions they are generally treated as separate species (Pucek *et al.* 2004).

The earliest records of *B. bonasus* are from early Holocene sites in Northern-Central Europe and southern Scandinavia, and by the mid-Holocene its maximum range extended from France in the west to Belarus and Ukraine in Eastern Europe (Benecke 2005). There is also zooarchaeological and historical

evidence of European bison across parts of central and northern Russia to the Urals, and from sites in the forest steppe of western Siberia (Kosintsev 1999; Sipko 2009) and eastern Siberia (Boeskorov 2006). Within the European bison, two well-known subspecies are recognised, *B. bonasus bonasus* and *B. b. caucasicus*, with the latter native to the Caucasus region (Mejlumian 1988) and possibly ranging into the Middle East (Uerpmann 1987), although its historical distribution in these areas requires further research (Flint *et al.* 2002; Pucek *et al.* 2004). A third, less-recognised subspecies is *B. b. hungarorum* (Perzanowski and Olech, personal communication, 2014).

Pucek *et al.* (2004) provided a historical account of the disappearance of European bison across Europe, with the species probably becoming extinct in western Europe first and then central and eastern Europe. By the end of the 19th century, only two wild populations remained, one in the Białowieża forest in Poland, which was exterminated in 1919, and the other in the Caucasus, which became extinct in 1927.

Distribution of European bison (*Bison bonasus*) and the extinct Pleistocene steppe bison (*Bison priscus*) in the **PLEISTOCENE**, **1890**, **1971** and **2011**. Stars denote smaller extant populations. Please note that only free-living populations are shown (Deinet *et al.* 2013)





2.2 ECOLOGY OF THE EUROPEAN BISON

The European bison is one of the largest terrestrial mammals in Europe; the weight of adult males ranges from 530–840 kg in the wild (Rafal Kowalczyk, personal communication, 2014). Females are smaller, weighing 320–540 kg (Krasinska, 2007, 2008; Stachurski 2003). They are sexually dimorphic, with the bulls having heavier heads and bigger humps than cows. Both males and females have horns and use them for fighting, although the bull's horns are thicker and wider and set further apart.

2.2.1 SOCIAL STRUCTURE AND REPRODUCTION

Free-living bison are known to form larger herds in winter when they are fed through feeding stations and so congregate around this artificial food source. Groups of bison do not form family units and mixed groups are the basic units for a bison population, comprising cows, juvenile males and females aged two to three, calves and occasionally

adult bulls. The average group size is 20 individuals. These herds stay together until spring when the first grasses and herbs appear, usually towards the end of April. The large winter herds then split into smaller ones of 12 animals on average, comprising cows with their calves and subadult males and females. Adult males become either solitary (60% of males) or form small groups of two to three bulls and only during the rutting season from August to October do they join the larger groups. Such groups graze and browse all day long in the area of their choice, but do not appear to want to defend it. This is why such mixed groups frequently meet each other and animals can transfer from one group to another. The composition of the group is thus not firmly defended. In the summer there is plenty of natural food, so the bison do not compete for food (Stachurski 2003).

The size and structure of mixed groups are changeable, some changes being seasonal (calving, joining of bulls in the rutting period), while others are behavioural. Groups meet frequently, combine and then quickly split, exchanging some

individuals. Young bulls exchange most frequently (Krasinska *et al.* 1999). A cow is the leader of a mixed group, usually a female with a calf. It has not been established whether leadership is permanent, although marked cows have been observed to be leaders up to the age of 20. However, since changes in the structure and size of groups are frequent, new arrangements in the hierarchy may occur (Krasinska *et al.* 1999).

According to the data from the Pedigree Book, European bison bulls living in captivity begin to mature sexually in the second year of life. Bison living in free-ranging populations and large reserves begin to sexually mature slightly later at the age of three, although they do not participate in reproduction until the age of six to seven. The reproductive period in males is short, usually lasting from six to 12 years of age. Ecological observations suggest limited participation of old bulls in reproduction (Krasinska *et al.* 1999).

Female bison usually become sexually mature in the third year of their life, giving birth to the first calf in the fourth year, although this can vary. In general, females breed every second year and produce only one calf at a time. Females can breed until the end of their life; the limit in a free-ranging population is

usually around 20 years of age although in captivity cows older than 20 years have been known to give birth. A cow will have approximately nine calves throughout its breeding life.

The rutting season in a free-ranging population lasts from August to October. During the rutting season a larger number of solitary bulls are observed due to the increased mobility of males searching for rutting cows. The average time a male might stay with a group is six days; one marked bull in the Bialowieza forest visited six groups during one rutting season. The same study revealed that during the rutting period cows remained in the same territory and did not move to search for bulls (Krasinska *et al.* 1999).

During the rut bulls become aggressive, especially towards younger adult bulls. They demonstrate their strength by breaking young trees, pawing the ground with their forefeet and wallowing. Although wallowing can be observed in animals of both sexes throughout the year as a grooming behaviour, in the rutting period it also forms part of the sexual behaviour of bulls. The bison choose sandy hills, gravel-pits, sandy roads, and roadsides for wallowing. When a female is in heat bulls may engage in brief but intense fights. Often even the



winner secludes himself from the herd and rests in isolation for a few hours. However, such fights are only sporadically observed in free-ranging herds as 'lower ranking' bulls will avoid the 'higher ranking' bulls. Once a female displays mating behaviour, the bull begins to isolate the cow from the herd, with bonding occurring for two to three days.

The gestation period of a cow lasts on average 254–277 days and calves are usually born in May or June, although 20–30% of births have been observed as late as August–October (Krasinska *et al.* 1999). For the period of parturition the cow separates from the rest of the herd and gives birth in a secluded place. Newborn calves usually weigh between 25 and 30 kg. The cow instantly defends the calf against any danger and after a few days they rejoin the herd. Calves will suckle for around a year, or longer if another calf is not born, although simultaneous suckling of two calves has been observed. A young calf is closely bonded with its mother but this bond seems to disappear in the second or third year (Krasinska *et al.* 1999, Stachurski 2003, Pucek *et al.* 2004).

2.2.2 DIET AND HABITAT USE

Due to uncertainty regarding the evolutionary history of bison, it is not possible to reconstruct its ancestral niche. However, there have been numerous studies of its current habitat use and dietary preferences.

European bison do not show strong food selectivity and as ruminants they can consume grass and fibrous food, similar to domestic cattle and American bison. However their digestive system requires a regular food supply, which is reflected in the activity cycle of European bison, as they roam in search of food, with breaks for rest and rumination. The amount of fresh food consumed by European bison over 24 hours has been established experimentally. Calves up to one year old eat 8.5 kg of fresh food every day, two to three year olds consume 19.5 to 28.5 kg and adults 23 to 32 kg (Krasinska *et al.* 1999). Other authors have reported that an adult bull consumes 30 to 60 kg of fresh food a day. In captivity an adult bison eats about 40 kg of hay or silage per day (Etienne Brunelle, Rainer Glunz and Fred Zenner, personal communication, 2013).

More than 200 different plant species are known to be part of the European bison's diet. Bison are so-called intermediate grazers, which means that a substantial part of their diet (between 20 and 65%) consists of browse material; bark, branches, leaves and seeds such as acorns, with the proportion changing depending on the season (Hofman-

Kaminska 2012). For this reason they can survive only in an environment that guarantees abundant and varying food throughout the year.

There are several limiting factors that are known to determine a bison range which include: overly wet conditions; heat and lack of water; steep slopes; unfavourable grazing/browsing conditions; extended periods of snow cover/frost; and deep snow. According to Heptner *et al.* (1966) the depth of snow cover determines the northern border of the species range and drives bison from the mountains to the valleys during wintertime. In many parts of the bison's historical distribution winter snow cover exceeded 50 cm, which could have hindered species survival across parts of its range (Pucek *et al.* 2004). However, the effect of snow cover on bison is not always clear, with some authors considering low snow cover (below 30 cm) in the first half of winter as an important factor for the survival of bison, whilst others argue that deep snow (up to 65–95 cm) does not noticeably disturb them, as they are effective at using their hooves and muzzles to move along trails and dig out food (Flint *et al.* 2002).

Research in Eastern Poland has found that bison prefer deciduous and mixed/deciduous forests, with alderwoods and coniferous forests visited more rarely, although habitat use did vary seasonally (Krasinska and Krasinski 2007). Kuemmerle *et al.* (2011) modelled the Holocene distribution of European bison based on known zooarchaeological and historical records using a species distribution modelling approach, the results of which suggested that European bison predominantly inhabited broad leaf and deciduous forest and that the species' distribution may therefore have been larger than direct faunal evidence suggested. However, this paper has been challenged on the grounds that forest habitat possibly never constituted optimal habitat for European bison, rather it was marginal habitat away from human activity (Cromsigt *et al.* 2012).

2.2.3. ECOLOGICAL NICHE

The natural (mid- to late-Holocene) guild of large herbivores in Europe comprises European bison; aurochs (*Bos primigenius*), now globally extinct as a wild species; wild horse (*Equus ferus*), now globally extinct as a wild species; Eurasian elk (*Alces alces*), also known as moose; red deer (*Cervus elaphus*); roe deer (*Capreolus capreolus*); fallow deer (*Dama dama*); reindeer (*Rangifer tarandus*); wild boar (*Sus scrofa*); muskox (*Ovibos moschatus*); mouflon (*Ovis orientalis*); chamois (*Rupicapra rupicapra*); and ibex (*Capra sp.*). Whilst their Holocene geographical ranges have generally



been well established (Benecke 1999), their respective ecological niches and any overlap is still unclear, particularly as many have been removed from European ecosystems for centuries or even millennia in some regions.

However, recent ecological research has provided some insight into inter-species competition. Solitary species such as elk and roe deer generally avoid herd animals, although under predation pressure they have been known to seek protection close to herds of other large herbivores (Wouter Helmer, personal communication, 2013). Ecological studies have also suggested that in resource-rich areas species will overlap, whereas in resource-poor areas species such as red deer and bison, as close ecological competitors, will demonstrate avoidance behaviour (van de Vlasakker 2008). There are recorded events of fighting between red deer and bison in the autumn during the rutting season (Catanoiu 2012), although these are rare. There may also be some resource competition between wild boar and bison during the autumn when acorns become readily available.

Domestic cattle are used for grazing management on many nature reserves across Europe, and it is often assumed that cattle and bison

are interchangeable in terms of their ecological role. However, although they are both generalist herbivores, their ecology does differ in several important features. Bison browse more than cattle and are more selective in their forage choice (Heijn 2012), consuming more herbs, forbs, browse and bark. A study of a herd of bison in the Netherlands with no additional feeding year-round showed four feeding peaks (increased feeding activity) in contrast to cattle which have two (Leo Linnartz, personal communication, 2012). Bison can break through vegetation and open up scrubland to reach their favoured food (Leo Linnartz, personal communication, 2012), and also display a higher seasonal behavioural variation than cattle, including rutting, migration and exploitation of seasonal variation in vegetation, which produces a higher degree of spatial heterogeneity in the landscape. In terms of habitat, cattle seem to prefer open, wet environments such as grasslands, whereas European bison tend to be found in open, dry areas (Heijn 2012). The relative ecological impact of the presence of both cattle and bison in the European landscape under no human management is unknown; however as Europe's other large bovid, aurochs, was present in Holocene landscapes alongside European bison for





many millennia, it is likely that they have distinct niches. Furthermore as domestic cattle rely on humans they lack a role in the ecosystem as prey for predators and scavengers.

Recent accounts of predation on European bison have generally been few and sporadic due to the small numbers of large predators in areas such as the Bialowieza forest. Following reintroduction of bison into the Polish Carpathians during the 1960s, accounts of wolf (*Canis lupus*) and brown bear (*Ursus arctos*) eating bison began to appear, although it was not clear whether they had actively hunted bison or were scavenging. There were reports in the Ukraine of four bison killed by bear, but due to the lack of evidence elsewhere for such behaviour, these incidents most likely involved isolated, sick or injured bison (Cantanoiu 2012). Previous studies have shown that in areas with

sufficient alternative prey, wolves will generally avoid large herbivores, whereas in areas where bison is the predominant herbivore, wolves can specialise in hunting bison by forming large packs, as is also known from North America e.g. Wood Buffalo National Park (Carbyn *et al.* 1993; van de Vlasakker 2008). Therefore, if wolf and bison numbers increase sufficiently, this could become a possibility in Europe. In the Bialowieza forest research showed that bison carcasses were mainly scavenged by ravens (*Corvus corax*), red fox (*Vulpus vulpes*), wolf and common buzzard (*Buteo buteo*) (Selva *et al.* 2003). Avian scavengers more frequently visited bison carcasses placed in glades than those located in the forest (Selva *et al.* 2003; Catanoiu 2012), probably to avoid attacks from other predators (e.g. goshawk (*Accipiter gentilis*), Eurasian eagle owl (*Bubo bubo*)).

2.3 CURRENT CONSERVATION STATUS

2.3.1 GLOBAL CONSERVATION ASSESSMENT

The IUCN Red List of Threatened Species currently lists the European bison as Vulnerable. In addition to this, it distinguishes between the two genetic lines: the Lowland line (*B. b. bonasus*) and the Lowland-Caucasian line (*B. b. bonasus* and *B. b. caucasicus*). The Lowland bison line is considered Vulnerable based on data from 2000, when the total population was 931 individuals. Although the population declined between the early 1990s and 2000, it is currently increasing. The Lowland-Caucasian line is considered Endangered based on data from 2000, when the total population was 714 individuals. The population decreased by 20% between 1990 and 2000, and has continued to decline since 2000.

A population estimate from 2011, with additional information from 2013, put the population of free-ranging European bison at 2,371 individuals. At the country level, strongholds for the species exist in Poland (36%), Belarus (34%) and Russia (17%), with smaller populations in Ukraine (9%), Lithuania (2%), Romania (< 1%), Germany (< 1%), Slovakia (< 1%) and Latvia (< 1%) (Table 1).

The current pedigree book (EBPB 2012) reports the global population of European bison as 4,987 individuals. However, data on European bison populations as of 31 December 2012 were published in 2014 and in accordance with data obtained from personal communication with breeders this number now stands at 5,046, with the number of individuals living in captivity at 1,643 and the number of individuals from free and semi-free herds at 3,403 (Magda Trzeciak, personal communication, 2014).

Recent global population estimates for free-ranging (un-fenced) European bison (*Bison bonasus*)

	ESTIMATED POPULATION	YEAR ASSESSED	REFERENCE
GLOBAL/EUROPE	3,230	2013	EBPB 2012; EBCC 2013, 2014
BELARUS (LOWLAND)	1,146	2013	EBPB 2012; EBCC 2013
GERMANY (LOWLAND-CAUCASIAN)	10	2013	VAN DE VLASAKKER 2013
LATVIA (LOWLAND)	12	2013	EBPB 2012
LITHUANIA (LOWLAND)	82	2013	EBPB 2012; EBCC 2013
POLAND (LOWLAND CAUCASIAN IN BIESZCZADY)	1,138	2014	EBPB 2014; EBCC 2014
ROMANIA (LOWLAND-CAUCASIAN)	21	2013	DEJU 2013; EBPB 2012
RUSSIA (LOWLAND-CAUCASIAN)	556	2013	EBPB 2012; EBCC 2013
SLOVAKIA (LOWLAND-CAUCASIAN)	15	2013	EBPB 2012; EBCC 2013
UKRAINE (LOWLAND-CAUCASIAN)	250	2013	EBPB 2012; EBCC 2013

2.3.2 CURRENT THREATS TO EUROPEAN BISON

Insufficient habitat

European bison continue to lack the space required for viable populations. Most conservation efforts are still focussing outside the species' optimum range and are mainly concentrated in forested and mountainous habitats (see section 3.2). This is largely because across Europe, suitable habitat for European bison generally coincides with regions that support high human populations, e.g. river valleys and lowland areas with productive soils.

Small population size

Small population size is also a major threat to the long-term viability of European bison populations. Most contain fewer than 50 individuals, despite the fact that the minimum viable population size has been estimated at 1,000 individuals (Perzanowski *et al.* 2004; Pucek *et al.* 2004). The species has low genetic diversity due to all modern populations being descended from only 12 founder individuals (Olech and Perzanowski 2002; Pucek *et al.* 2004) and the genetic contribution of the 12 founders is also uneven, highly dominated by one pair. The mixing of both Lowland and Lowland-Caucasian lines of European bison has also locally led to the loss of founder genes specific to the Lowland-Caucasian line.

Disease

The limited genetic heterogeneity, low numbers and lack of natural selection might all have contributed to the species' weak resistance to diseases (Pucek 2004, van de Vlasakker 2008). An important disease, balanoposthitis, affects the male reproductive organs and is manifested in the inflammation of the penis and prepuce. Despite years of study, its pathogenesis has not yet been clarified (Pucek *et al.* 2004). Parasitic diseases remain a serious threat to the present population. Bison that receive supplementary feeding show higher parasite infestation due to concentration of bison and subsequent defecation at fixed feeding locations, combined with more sedentary behaviour encouraged by supplementary feeding (Radwan *et al.* 2010; Pyziel *et al.* 2011). Viral (foot and mouth disease) and bacterial diseases (tuberculosis) can also be transferred from domestic cattle to bison, and it is these diseases which are the most dangerous for the bison. Low numbers of bison in combination with additional stress factors such as climate change are also

likely to increase chances of vulnerability to ‘alien’ bovine diseases, as was visible with the bluetongue outbreak a few years ago.

Low acceptance of European bison

Due to agricultural crop and forestry damage caused by European bison (see section 3.6), the presence of bison is not always fully accepted by local communities. For example, despite a compensation scheme, local concern over bison presence has been documented in Poland (Hofman-Kaminska 2012). If this occurs across Europe, this may make it more difficult to gain acceptance for further bison reintroduction projects, thus limiting the ability to increase overall numbers of bison in order to improve its conservation status.

Hybridisation with cattle

Over time, the release of bison has fuelled fears of possible hybridisation between European bison and domestic cattle (Catanoiu 2012); a Human Dimension study in the Rothaargebirge in Germany showed that this was the number one fear of the local farmers (Decker 2006). Although there were free-ranging European bison in Bialowieza until 1919, and historical accounts from 1780 mention the constant presence of a great number of cattle (7,000–10,000), there were no reports of breeding between bison and cattle. In Lithuania, bison range overlaps with agricultural land, yet despite numerous complaints about the presence of bison males around domestic cattle, there was only one record of them mating (Linus Balčiauskas, personal communication, 2004). A hybridisation attempt between the two species was carried out during the Communist era, in order to develop hybrids that could resist harsh environmental conditions and provide more meat. Both domestic bulls bred with bison females and bison bulls with domestic

females in enclosures, but due to lack of interest or active aggression only 14% of attempts were recorded as mating. Approximately 30% of these resulted in miscarriages and calving had to be assisted to a degree that offspring would not have survived in the wild. Therefore hybridisation in the wild between the two species is a low to non-existent threat (Krasinska 2008).

2.3.3 EUROPEAN CONSERVATION INITIATIVES RELATING TO EUROPEAN BISON

In Europe, the bison is included in Appendix III (Protected Fauna Species) of the Bern Convention on the Conservation of European Wildlife and Natural Habitats (Council of Europe 1979). The European bison is also included in Appendix II and IV of the Habitat Directive of the European Union as a priority species. ‘The Status Survey and Conservation Action Plan: European Bison’ created by the IUCN/SSC Bison Specialist Group (Pucek *et al.* 2004) contains an overview of European bison conservation and sets the main direction for its conservation and management. It has been adopted by the Bern Convention/Council of Europe and therefore should be guiding and binding for member states. However, national governments have not taken on the responsibility and have failed to either create national bison rewilding plans and/or implement a national strategy for bison conservation, with the exception of Russia, Poland and Romania. Even though the bison is a habitat directive priority species, nature reserve managers often do not engage with the rewilding/reintroducing of native, extinct species such as the European bison initiatives, for apparent fear of losing other habitat directive target species.



2.4 EUROPEAN BISON CONSERVATION

2.4.1 THE EUROPEAN BISON PEDIGREE BOOK

The idea of restoring the European bison using captive animals was publicly presented for the first time by Polish zoologist J. Sztolcman at the 1st International Congress of Nature Protection in Paris, 1923. In that same year, the International Society for the Protection of the European Bison (Internationale Gesellschaft zur Erhaltung des Wisents) was founded in Frankfurt am Main. The statute of the Society included the maintenance of the European bison by planned breeding and distribution, followed by introductions to large forest complexes (Pucek *et al.* 2004).

A particular accomplishment of the society was the maintenance of the species' genetic purity, especially in the early period when there were numerous hybrids with American bison and cattle produced in various zoos. For this purpose, a studbook was created, the European Bison Pedigree Book (EBPB). The first register of all European bison living in the world (at first also their hybrids) was

published in Germany. With great effort by the first editors of the EBPB, all crossbred animals were eliminated from breeding with pure-blood European bison. After World War II, the EBPB was edited in Poland, under the auspices of the State Council of Nature Protection. Since 1993 Bialowieza National Park, Poland, has published the EBPB (Pucek *et al.* 2004). It remains an important source of data on the numbers of European bison in different locations (Pucek *et al.* 2004).

After World War I European bison only survived in a few European zoological gardens. In 1924 there were only 54 European bison (29 males, 25 females) originating from 23 founders. However, 11 of these did not have pure progenies and so were excluded from the pedigree book. The number of founders of the current population is therefore 12 (Wanda Olech, personal communication, 2014). Eleven of the 12 founder animals (all *B. b. bonasus*) originated solely from the Bialowieza Primeval Forest, from



the Berlin and Budapest zoos and Pszczyna. One bull of *B. b. caucasicus*, born in 1907 in the Caucasus Mountains, was brought to Germany in 1908.

Two genetic lines have been distinguished in recent populations of the species:

- The Lowland line (LB) originates from only seven founders (four males; three females) and includes pure animals of *B. b. bonasus* subspecies.
- The Lowland-Caucasian line (LC), (*B. b. bonasus* x *B. b. caucasicus*) originates from all 12 founders (five males; seven females), including the bull of the Caucasian subspecies.

Data sources for the EBPB indicate that the world population of European bison is highly inbred. As found during the 1980s, the average inbreeding coefficient for live animals in the world population was equal to 20.2%. The average inbreeding coefficient for live animals with full pedigree in the late 1990s was equal to 43.98% for the Lowland line, and was much smaller and equal to 26.28% for the Lowland Caucasian line (Olech 1998, Pucek *et al.* 2004). Therefore it appears that genetic variation in the European bison has been severely reduced by the historical population bottleneck.

In addition to the free-ranging populations of European bison, there are around 1,200 individuals managed in captivity (around 30% of the total global population), which play a key role in maintaining genetic diversity in the species.

More than 200 breeding centres exist in Europe and about 60 of those participate in the European Endangered Species Programme (EEP) under the EAZA (European Aquarium and Zoo Association) umbrella. The larger bison breeding centres are united under the European Bison Conservation Center (EBCC), which has a coordinating role in bison breeding.

2.4.2 REINTRODUCTIONS: THE STORY SO FAR

During the process of European bison restitution, two periods can be distinguished. The first, lasting until 1952, involved the intensive breeding of European bison in zoos, wildlife parks and specially created bison breeding centres. A second period commenced with the creation of free-living herds.

The first reintroduction of European bison to

forest ecosystems started in Bialowieza Forest (1 on the map) in 1952. From about 1960, a reproducing population was established (Krasinski 1983). Similar attempts were also made in the Belarusian part of Bialowieza Forest (Korochkina and Kochko 1983) (2). During the following period, free-ranging herds were formed in Poland, Lithuania, Belarus, Ukraine and Russia. There were further initiatives to create free-ranging herds but these were unsuccessful, mainly due to the lack of protection, resulting in poaching and the extinction of herds in the Caucasus (Russia, Azerbaijan). Nearly all free-ranging bison are distributed within the eastern part of the historical range of the species. As a result of reintroductions, the Lowland line (LB) bison now generally occupy the northern part of this range, whereas the Lowland-Caucasian (LC) animals occupy the southern and eastern part.

The following section briefly summarises some of the key bison reintroductions across Europe so far, following a chronological order as much as possible. As many new initiatives have taken place, it is not possible to include them all, therefore only projects with introductions in areas over 100 ha and with a strong conservation theme are discussed, with smaller projects only briefly summarised to highlight some 'lessons learned'.

Poland

Reintroduction began in the Bieszczady Mountains (part of the Carpathian Mountain range) (3) in 1963, in a wooded region near the border with Ukraine. Between 1963-1964 eleven males and eight females of the LC line were brought from the Niepolomice and Pszczyna Reserves and new releases occurred in 1971 (80 animals), 1975 (four males, eight females) and 1976 (one male, five females). These animals located in the Stuposiany forest district are known as the 'Eastern herd' (Perzanowski and Marszalek 2012). In 1974, a group of five animals (one male, four females) from Pszczyna were brought into an enclosure in the release area of Komancza. The group was supplemented with another 10 individuals (five males, five females) from Pszczyna and in 1980 all 15 individuals were released into the wild. This group is known as the 'Western herd'.

The 'Eastern herd' was divided into smaller groups that migrated north and the 'Western herd' generally remained a single herd. As all the released bison came from Polish breeding centres, it was decided to supplement the herds with new individuals to compensate for underrepresented founders. With the help of genetics expert Wanda Olech, several animals from Western European zoos/bison breeding centres (Sweden, Denmark, Czech Republic, Ireland and Germany) were selected and added to the population from 2003. Growth of

the Bieszczady population has been positive with 97 individuals recorded in 1990, 271 in 2007 and 304 in 2010. Although it declined to 256 in 2012/2013 as a result of TB, it increased again to 270 by 2013/2014 (Perzanowski and Marszalek 2012).

Several other initiatives have taken place in Poland. The European bison initiative in West Pomerania (4) has the potential to grow to a new metapopulation. In 1980 eight European bison were brought to the Forest District of Walcz from Bialowieza National Park. From 1980 to 2005 the population reached a total of 24 individuals, although in the 1990s there were reports of more than 30 individuals. During this period there were no protective measures with regards to the bison. Since 2005 the herd has been supplemented with unrelated animals to support the population's gene pool, they have been fed over winter and telemetry monitoring has been carried out. As a result, the size of the population began growing rapidly and in just eight years tripled in size. The population now comprises 132 individuals. It is known as the Miroslawiec herd and inhabits approximately 15,000 ha of field-forest area in the counties of Miroslawiec, Tuczno, Walcz and Wierzchowo Pomorskie.

A second herd, the Drawsko Herd (5), was also created in 2008 by the West Pomeranian Natural Society and has increased from an initial 16 individuals to 54 today. The herd inhabits approximately 8,000 hectares in the Forest district of Drawsko, which is the largest military training zone within Poland.

The West Pomeranian herds are in excellent condition and rapidly increasing and, as such, several tourist activities based on watching them in the wild have been established.

There are also two further populations in Poland comprising nearly 100 individuals each and there are additional plans for a reintroduction in Augustowska forest (Wanda Olech, personal communication, 2014.)

Ukraine

The first bison reintroduction was in 1965 in Maydan Forestry, Skolyvski Beskyd mountains (6) (Perzanowski, personal communication, 2014), followed by a reintroduction in the Bukovynska area (7), near Cernauti, in 1970. Belarusian and Russian breeding centres initially supplied a total of 19 (eight males, eleven females) individuals and then another four (one male, three females) individuals in 1977. Herds increased in the early 1990s until the end of the Communist era, after which a sharp decline occurred due to poaching and a lack of management. The population has been in decline for the past 15 years due to lack of sufficient protection. In 1994 the wild bison population numbered 656 individuals,

but was just 227 in 2010. The herd from Bukovynska is the closest to the border with Romania and therefore it might be feasible to link this population with the Vanatori Neamt population in Romania (see below) in the future. Due to the comparable conditions (geographical, natural, historical and political) between the two regions, many of the lessons learned from Bukovynska can also be applied to support further bison reintroductions in the Carpathians.

Slovakia

In 2004 five bison were reintroduced into Poloniny National Park (8) using individuals from different zoos and soon after were joined by wild individuals from Poland. Two more individuals were later released. In 2012 the population numbered around 15 individuals, following eight births in the previous six years (Vaglio, personal communication, 2013).

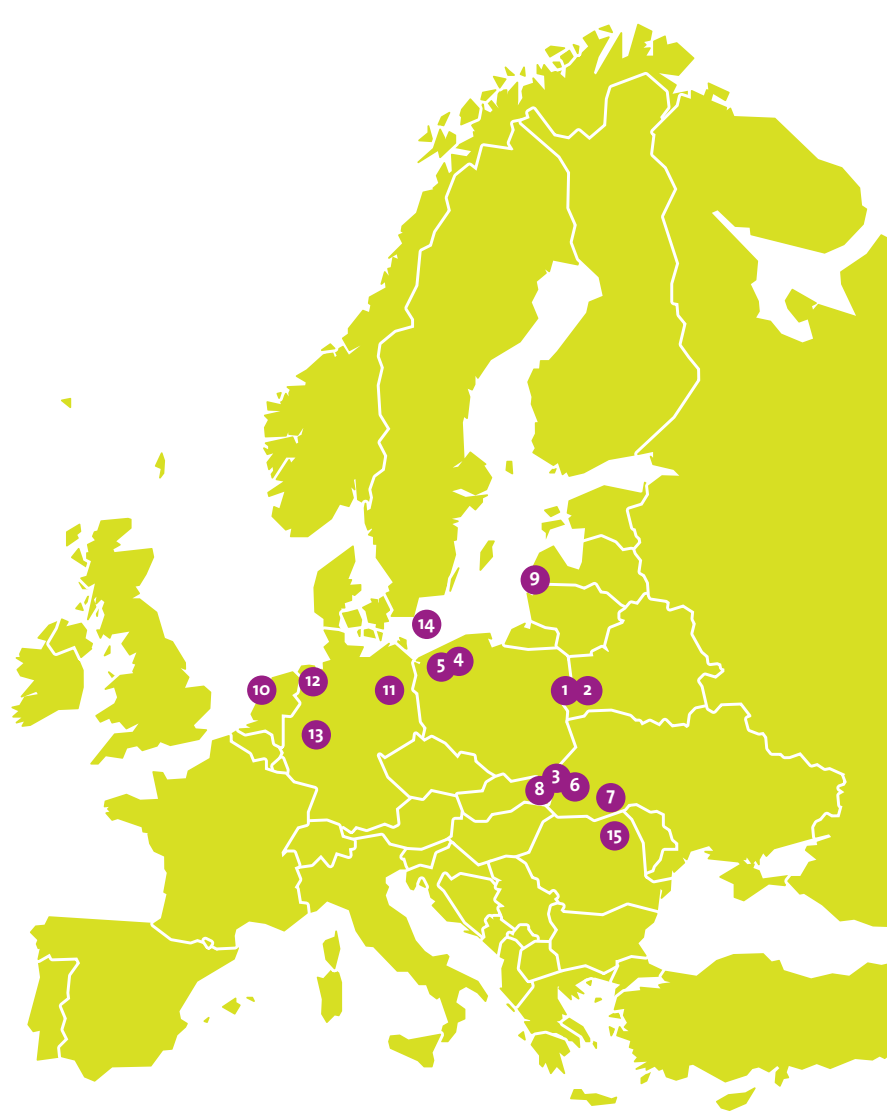
The bison make particular use of the central area of the park called 'Starina', which has low human presence and is characterised by the presence of large meadows, timber cutting and cemeteries of villages that were evacuated and destroyed for the construction of a water reservoir and some military cemeteries during World War I. However, recently several small cabins have been built illegally and are used seasonally. The vegetation is a complex mosaic of pastures, meadows, transitional habitats and shrub land, typical of areas being currently abandoned across Europe. In this area there are some integral reserves of limited extension, while the majority of the areas are subject to intensive forestry. Wolf hunting is allowed in the area and mushrooms are traditionally collected. The European bison was introduced to promote eco-tourism, but its presence has caused several conflicts, particularly with hunters who consider the species a potential source of trouble for other ungulates, without specifying the problem.

The major grounds for the conflict are:

- The introduction of bison is associated with the same government that removed people from their homes in 1988;
- The Slovakian government has failed to develop eco-tourism and to support local people in business development;
- There has been little involvement of local people in the planning process and locals therefore lack 'ownership' over the project;
- When conflicts with bison arise, these are not dealt with promptly.

Latvia

The Latvian representative of the Council of Europe has not accepted the European bison as a native species. Therefore, with the cooperation of



Reintroduction areas for the European bison

local authorities, bison were first released into a semi-reserve (> 200 ha) within Lake Pape Nature Park (9) in Latvia in 2004, prior to starting an official reintroduction application. However, due to lack of funds to maintain the site, part of which was located in a polder, bison escaped and have been living wild, unmanaged and unmonitored. Ideally this population should be supplemented with new individuals and potentially linked with the Lithuanian population.

The Netherlands

In 2007 bison were released into Kraansvlak (10), a fenced area in the National Park Zuid Kennemerland. It is a diverse, open dune landscape (44% grassland, 35% shrubland, 4% open sand). The herd initially started with three animals from Poland and grew to 21 (March 2014). They were not supplementary fed, suggesting bison can thrive in more open landscapes and in densities up to one bison per 15 ha. They have reduced woody plant cover through heavy debarking in winter (Oquinea Valluerca 2011). This may be an example of the way in which bison can contribute towards the suppression of shrub encroachment and the maintenance of a mosaic grassland, shrub and woodland habitat (Cromsigt *et al.* 2012).

Germany

In Germany three projects have been initiated in recent years: Döberitzer Heide, Eleonorenwald and the Rothaargebirge.

The Döberitzer Heide (11) is a 5,000 ha former Soviet military training area close to Berlin. It contains a fenced 'wilderness' zone of 1,860 ha into which red deer, Eurasian wild horse (Przewalski's horses) and European bison were released in 2010. By 2013 the bison population had grown from 11 to 46 individuals, although as the area still contains explosives, it is not fully accessible and therefore full surveys are difficult to carry out. The area is very sandy, and thus relatively resource-poor but the animals are not supplementary fed (Peter Nitschke, personal communication, 2013). The area already holds a density of 25 bison per 1,000 ha, which is much higher than the five bison per 1,000 ha density which is proposed by some bison specialists (Flint 2002).

The Eleonorenwald (12) project started in a 2,700 ha site in Niedersachsen in 2005 but unfortunately ended in 2008. A 1,000 ha fenced area within the site is privately owned and had been used as a hunting ground for over 100 years, containing red deer, fallow deer, roe deer and wild boar, and is normally open to the public. The Ministry of Environment initially co-operated with the forest owners to release bison in the area on the provision that the public could only visit the area as part of a guided tour. However, local politicians and authorities subsequently gave instructions to allow normal public access and as none of the project partners wanted to take responsibility, the project closed and seven bison were moved to the Döberitzer Heide whilst one bison bull went to Belgium. The major conflict arose between the forest owner and the authorities even before the start of the project; earlier resolution of this could have prevented the escalation of the conflict.

By contrast the project in the Rothaargebirge (13) provides a good example of a carefully managed reintroduction, lessons from which could be used to inform further reintroductions. This initiative is located in North Rhine-Westphalia, one of the most densely populated areas of Europe with 523 inhabitants/km², and was started by a private forest owner in cooperation with the NGO 'Taurus Naturentwicklung' in 2003. The project goal was to establish a free-living herd of around 25 animals in a 4,300 ha area. From the outset it received political support from a regional politician and local mayor as they viewed the return of the bison as a good opportunity for regional development after the decline of winter tourism. However, the project engaged with local communities early on,

carrying out a comprehensive feasibility study in 2005–2006 and holding several public hearings. A Human Dimensions of Wildlife Management (HDWM) study was also carried out as part of the feasibility study (Decker *et al.* 2010), the outcomes of which could be used to tailor a bespoke communication strategy to overcome negative attitudes, for example from farmers and foresters, and to encourage confidence in the project. In addition a steering group was established with relevant stakeholders to discuss concerns and answer questions.

On the basis of the feasibility study, the project was promoted and financed by the Federal Agency for Nature Conservation and the State Ministry of the Environment of North Rhine-Westphalia. Bison arrived in 2010 and were first kept in a small (< 2 ha) enclosure for six months after which they were released into an 88 ha enclosure. In the interest of public safety, research was also carried out to determine bison reactions to hikers, dogs etc. in this area. In 2013 eight bison were then released into the wild and became the first bison living in the wild in Germany in c. 400 years. Two calves were subsequently born, bringing the total group size to 10 individuals. The population was well monitored and a local farmer was appointed as a bison ranger. A special tourist attraction, 'Wisent-Wilderness', was also created to allow tourists to view bison. The total cost of the project (2003–2013) has been estimated at €15 million (Johannes Röhl, personal communication, 2013).

Scotland

In 2011 three bison were transported to the 14,000 ha 'Alladale' private estate in Scotland. The reintroduction proposed first releasing the bison into a semi-reserve of > 100 ha and then into the whole estate which would be fenced. However, the plan has met with objections from ramblers and hikers, who argued that the proposed fence would contravene the Land Reform (Scotland) Act, which protects the freedom to roam. The landowner put a halt to the project in 2013.

Denmark

In June 2012 one male and six female bison were moved to the Danish island of Bornholm (14), a project initiated by the Danish government. The bison were released into a 200 ha enclosure in the state forest of Almindingen, in the centre of the island. The current plan is to release these animals into the wild after five years when they have adjusted to their new environment. It is hoped their presence will enhance biodiversity by maintaining open grassland and will also increase tourism on the island (Brandtberg and Dabelsteen 2013).



KEY LESSONS LEARNED

Romania

Since the spring of 2012, five animals have been released into Vanatori Neamt Nature Park (15), a major achievement for the conservation efforts of this species in Romania. The reintroduction was carefully prepared, with the establishment of an information centre and a broad educational project for the local communities. Bison were selected throughout Europe and kept in a fenced acclimatisation/breeding area for the first few years. From there the animals were released into an isolated forested area of around 5,000 ha, with deciduous and mixed forests and an altitude of between 800 and 1,000 m, with low human presence. The released animals were monitored using radio-telemetry and initial conclusions indicated that the selected area was suitable for a free-ranging population. In March 2013 a second group of five animals was released in the same area and also appeared to adapt well to their new home range. The two groups joined and two calves were born, increasing the total to 12 animals in the wild in 2013 (Razvan Deju, personal communication, 2013).

- A big effort is needed to bring European bison out of the danger zone.
- More releases of bison are needed in areas where they can build up viable populations.
- Bison can potentially thrive in open landscapes as well as forested areas.
- Pre-release infrastructure must be secure.
- Protection of bison and anti-poaching initiatives are vital for the long-term success of bison reintroductions.
- Herds need to be carefully managed in the early stages to promote survival and population growth.
- Relationships with local/national governments need to be established early on in order to gain support.
- Stakeholders e.g. landowners, forestry, government, should be brought together for consultation during the planning process.
- Local people need to be consulted and included from the outset in the planning process.
- Human-bison conflict must be acknowledged and tackled early on.

17 bison were released in the Southern Carpathians, Romania in May 2014. With millions of hectares of land available for the animals plus strong support from the local community and authorities, the Tarcu mountains herd can potentially grow into the largest wild bison population in Europe. Rewilding Europe will continue to release animals there annually, with the aim to grow the population to more than 500 animals by 2024.



3. REWILDING EUROPE'S GUIDING PRINCIPLES FOR BISON CONSERVATION

The three pillars of Rewilding Europe's initiative are rewilding, communication and business development based on wild values. Based on these, and taking best available knowledge on European

bison and lessons learned from bison conservation elsewhere into account, Rewilding Europe has developed guiding principles underpinning this Bison Rewilding Plan.

GENETIC MANAGEMENT

Current bison conservation is still focused on the separation of the two genetic lines (LB and LC) to strengthen genetics both in captivity and (semi-) wild populations. Due to the strict separation of the two lines, surplus bison cannot always be relocated and are regularly culled, despite overall low numbers in the wild. European bison remain relatively highly inbred.

The IUCN Bison Specialist Group favours the separation of the two genetic lines, especially for the LC line (the only line containing the genes of the male *B. b. caucasicus* and the other eleven founders). The genetic contribution of the *B. b. caucasicus* male and of the four females (which were originally LC) is decreasing due to the influence of individuals of the LB line, while the contribution of the seven common founders to both lines is increasing (Olech 2008).

If the total number of individuals of each line is approximately 2,722 for the LB line and 2,373 for the LC line, the situation is completely reversed in the case of the numbers in captivity (527 for LB and 1,115 for LC) and in (semi-) freedom (2,195 for LB and 1,258 for LC) (Olech, personal communication, 2014; EBCC 2014). The LC line has a greater genetic variability than the LB line and the genetic pool of the LC populations in captivity is better than that of the free populations. Therefore the importance of reintroduction using captive individuals from the LC line in order to maintain genetic variability of the entire species is of great importance. Bison genetics expert Wanda Olech considers that if the free population of the LC line has grown to 3,000 individuals or more and the LB line to 3,000 individuals or more, this would ensure the sustainability of the species.

In consultation with Wanda Olech it was decided that exceptions may be made for isolated herds where connections with other herds are not foreseen e.g. in Croatia. In these instances, reintroductions may start with LB animals but then be supplemented with animals from the same line. However in case this is not possible, isolated herds can be supplemented using animals from any one line in order to avoid any culling of young animals surplus to the breeder. For those projects where it has been decided to establish a population of the LB line, free-living animals from the Bialowieza forest will be preferred due to the optimal genetic status of this population within the LB line, its large size and the active culling as a management action in this region.

3.1

GUIDING PRINCIPLES:

- Given the small number of LC bison in the wild, Rewilding Europe will focus their reintroductions primarily on the LC line in accordance with the proposed distribution of the lines by the EBCC (North Europe LB line, Carpathians LC line).
- However, decisions on the use of different genetic lines may need to be made on a case-by-case basis, depending on the reintroduction context.
- Support adding surplus animals within the same line in existing populations for genetic refreshing.



3.2 THE REFERENCE: HISTORIC DISTRIBUTION OR SUITABLE HABITAT?

There is some debate concerning the Holocene distribution of the European bison due to the incomplete reconstruction of its Holocene range in the western Palaearctic. There is no evidence yet for either *B. bonasus* having inhabited Western Europe into the Iberian Peninsula or southern Europe into the Italian Peninsula. There is also no direct evidence for its distribution in most of the Balkan Peninsula, although the fact that it inhabited Eastern Europe and areas further south and east into the Caucasus makes it more likely that it could have been present in this region. However, bones of European bison are notoriously difficult to distinguish from those of Europe's other large bovid, the aurochs, making it possible that remains of European bison could have been misidentified as those of aurochs in some regions (Benecke 2005). Aurochs appeared to be more widely distributed than European bison, with bone evidence found in the Iberian, Italian and Balkan peninsulas and also further north in Britain (Van Vuure 2005). Therefore it may be worth re-examining the zooarchaeological record of proposed reintroduction areas that lack past evidence for bison. Although very well preserved and complete remains are needed to morphologically distinguish the two species, genetic analysis could be used to determine species status.

There has also been a vigorous debate in the literature around whether the European bison was a forest-adapted species or whether its forest distribution represented marginal habitat due to avoidance of areas of high human activity. Kuemmerle *et al.* (2011) took a species distribution modelling approach to reconstruct the past distribution of European bison. Based on known occurrence points and associated habitat, they used computer modelling to make predictions about other areas of suitable habitat that the species could have potentially inhabited and areas where it might have been extirpated from. They concluded that bison thrived in broadleaved and coniferous forests and that it might have had a more northerly and easterly distribution than previously reported.

However, Cromsigt *et al.* (2012) disagreed with their interpretation of the results and argued that forest never constituted optimal bison habitat. They quoted recent studies regarding the European bison's evolutionary background (Shapiro *et al.* 2004), dental morphology (Mendoza and Palmqvist 2008) and diet and microhabitat selection (Kerley *et al.* 2012) that all suggested that it is a species of open or half-open habitats, and that purely forested areas represented marginal habitat. Given the current absence of clear evidence for the ancestral niche of *B. bonasus*, it might be reasonable to assume a wider inter-



pretation of its potential optimal habitat than the current approach, which focuses almost exclusively on forest habitat. This discussion must also take into account the on-going scientific debate regarding the state of the primeval landscape of lowland Europe, and whether this comprised closed canopy forest versus more open park-like landscapes (Vera 1997 and Sandom *et al.* 2014), and the role bison and other large herbivores play in shaping the landscape.

Furthermore, there is a danger that conservation managers actively confine the bison to suboptimal habitat (Cromsigt *et al.* 2012). Optimal habitat for establishing meta-populations of bison has so far focused on mountainous areas of eastern and central Europe, in particular the Carpathians. However, this type of mountainous forest habitat could in fact represent marginal habitat that is only appropriate for bison due to associated low human densities in these areas and therefore low potential for human-wildlife conflict.

There is no long-term experience of releasing bison into semi-open habitats in unfenced conditions. Therefore large-scale, potentially experimental (re)introductions in diverse habitats and under different climate conditions throughout its natural range are essential, not only for conservation purposes but also to gain a better understanding of the ecology of the species. Abandoned open habitat such as fields, pastures, meadows and (former) military areas may become important for European bison in such areas, because they provide more and better quality forage than the forest herb layer (Pucek *et al.* 2004).

Whilst we appreciate the scientific basis on which current management is based, due to the high degree of uncertainty that remains around bison management, Rewilding Europe advocates a hands-on conservation and a 'learning by doing' approach. We will then disseminate lessons learned from experimental reintroductions back into the scientific community to inform future reintroductions and conservation efforts.

GUIDING PRINCIPLES:

- Rewilding Europe will strive to work to restore bison not only in forested regions, but will also consider reintroducing them into areas of more open forests and semi-open habitats with abundant grass and herb vegetations.
- Rewilding Europe will work to link different ecosystems across eastern and western Europe, for example the mountainous Carpathians and the surrounding river valleys.
- Rewilding Europe will interpret the European bison range in relation to its ecological requirements and future climate change, rather than solely as its historical Holocene distribution.
- Rewilding Europe will use and apply the Guidelines for Reintroductions and Other Conservation Translocations (IUNCN 2012) for bison reintroductions and re-stockings.

3.3 EUROPEAN BISON AS A KEYSTONE AND UMBRELLA SPECIES

A two-part definition of keystone species adapted from R. Paine's (1969) original work is often used as a standard. The first part of this definition is that the presence of keystone species 'is crucial in maintaining the organization and diversity of their ecological communities' (Mills *et al.* 1993). The second part of Paine's standard keystone species definition deals with the relative importance of the species. According to Mills *et al.* (1993), a keystone species must be 'exceptional, relative to the rest of the community, in their importance'. As the bison has been extinct for many decades in Europe and now exists at reduced densities in often managed populations, it is very difficult to infer the potential impact of bison on wider communities of flora and fauna and thus define it as a 'keystone species'. However, several lines of evidence do suggest that the species would have a vital ecosystem-level function.

Large herbivores are widely recognised to strongly influence soil processes and the structure and diversity of plant communities. They can affect vegetation directly by grazing or indirectly by changing the turnover rates of nutrients. Herbivores play a key role in nitrogen turnover; they recycle nitrogen by eating plants and redistributing it through faeces and urine (Hobbs 1996), thus increasing the patchiness of nitrogen availability, plant distribution and growth. It has been argued that plant species diversity has declined due to an increase in fires following removal of grazing and so one of the goals of reintroducing bison to northern Spain, for example, is to prevent fires and increase biodiversity (Fernando Moran, personal communication, 2010).

On death, a large herbivore carcass also releases a local and highly concentrated pulse of nutrients into the soil (Melis *et al.* 2007). Thus a European



RUUD MAASKANT / PWN

THE EUROPEAN WILDLIFE BANK

Rewilding Europe founded a 'wildlife bank' to stimulate the breeding of well adapted bison for rewilding projects. It is a tool for Rewilding Europe to provide rewilding areas and initiatives with bison and other large herbivores, by making so-called contracts with third parties, mostly land managers and owners in the rewilding areas. On the expiration of the contract, individual animals will be returned to the bank, where they may be used for a new contract. If animals are released fully into the wild (the ultimate goal) they will not be returned to the bank. This will allow

for some control over herds and maintain a high quality/standard of bison reintroductions. Investors (partners) in the European Wildlife Bank can expect a return on their investment based on the animals' reproduction rate. In Rewilding Europe areas where bison cannot (yet) be released, the (semi-wild) enclosure facilities will provide breeding opportunities, as these 'surplus' animals will be put in the wildlife bank. As these bison would be accustomed to living in semi-wild conditions they would be suitable for establishing founder groups for other reintroductions.

bison carcass, with its large body mass, could potentially provide a significant source of nutrient enrichment, which influences the heterogeneity and diversity of plant communities. Carcasses are also an important source of food for many species. A recent study identified more than 596 species of invertebrates and mammals that visited carcasses in Europe (Poelarends *et al.* 2012). Scavenging on bison carcasses has also been witnessed (Selva *et al.* 2003; Catanoiu 2012) and so could provide an important food source in the ecosystem, for example in countries such as Spain, Bulgaria and the Balkans where vultures depend entirely on carrion but are at risk of extinction due to EU rules that prohibit abandoning domestic animal carcasses. The restoration of European bison in these regions would therefore be of significant ecological benefit.

Finally, Rewilding Europe also considers European bison to be an umbrella species, as by protecting the European bison and the large areas of habitat that it requires, many other plant and animal species would benefit. Around 50% of the plants consumed by the bison rely on animals like the bison for seed dispersal (Jaroszewicz & Piroznikow 2008)

As a large, charismatic mammal it also has the potential to be an iconic species both for nature conservation as well as for regional/rural development. The European bison could represent the restoration of a natural ecosystem or the establishment of a protected area. It could be a strong symbol not only for nature conservation projects but also for a region, local businesses or specific products/brands.

GUIDING PRINCIPLES:

- The bison plays a vital role in several European ecosystems and is therefore one of the main conservation priorities in a number of rewilding areas where Rewilding Europe is working.
- The European bison should be used as a symbol for promoting wider ecological restoration of European landscapes.

Bartosz Pirga, wildlife biologist at Bieszczady National Park, Poland, taking a faeces sample from European bison for DNA and parasitic analysis



3.4 EUROPEAN BISON MANAGEMENT

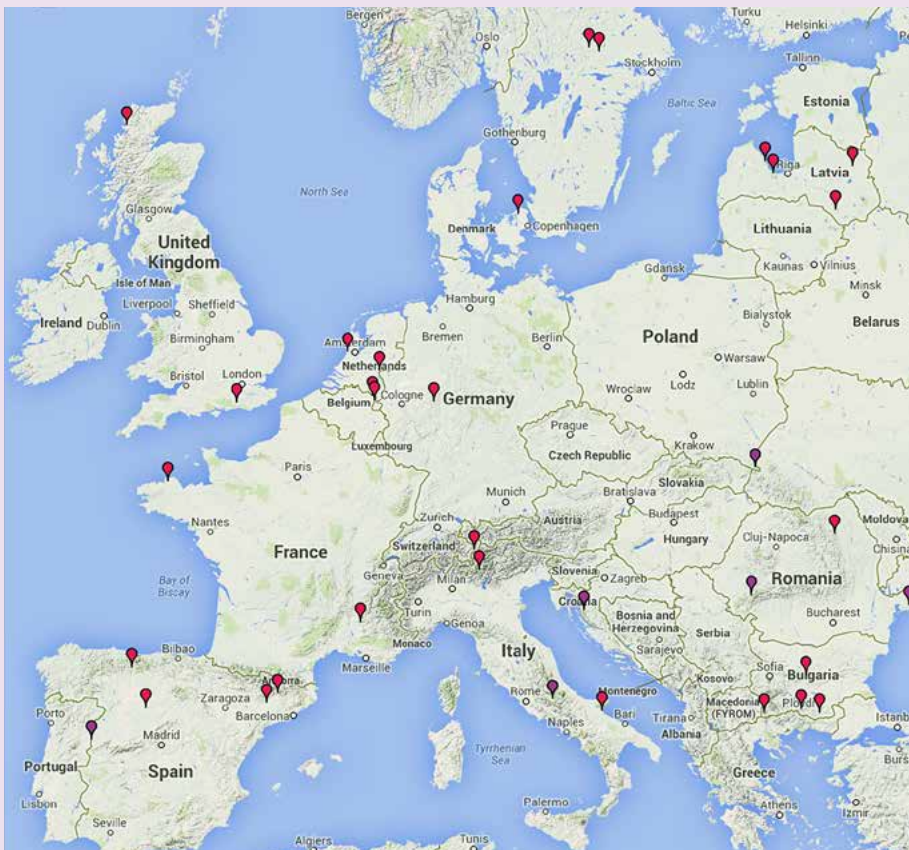
For many populations, several administrative bodies are currently responsible for managing the same bison population but these all have different interests (e.g. forest administration, protected areas, agricultural lands), a situation that can compromise effective bison management. Rewilding Europe believes that the management and protection of the species should be the responsibility of one administration.

Due to conflicts with agricultural and forestry interests, general conservation strategies for the bison are aimed at maintaining very low densities of bison, and because of artificial feeding, bison have a minimum natural impact on ecosystems and biodiversity. Traditional forms of European bison management are based on zootechnical practices, rather than ecosystems ecology, and along with supplementary feeding during winter, this slows down the ability of European bison to naturally adapt and fulfil their niche within the ecosystem. For example, many people, including conservationists, still view debarking as damaging for forests and to economic interests but this

perception is now a serious obstacle in establishing new populations and allowing existing populations to grow. Some of the Rewilding Europe project areas are large enough and have a suitable habitat to sustain a viable population within a continuous range. A viable population (> 1,000) still does not exist 60 years after the first reintroduction.

According to the IUCN European Bison Status Survey and Conservation Action Plan (Pucek *et al.* 2004), a population of at least 100 individuals could be regarded as safe. In 1990 there were six such herds (two in Poland, one in Belarus, two in Ukraine and one in Russia). In 2004 four herds remained (in Poland, Belarus and Ukraine) and as of 2012 there were four herds in Poland, Russia and Belarus.

Despite this, all three are managed by culling and up to 38 individuals are culled per year in the Bialowieza forest (see overview below; Jerzy Dackiewicz, personal communication, 2012). Culled European bison are sold for their meat and fur and therefore do generate some revenue for local economies in Bialowieza, but wildlife-



Rewilding Europe areas (in purple) and other rewilding initiatives (in red) across Europe. By August 2014, 34 areas are part of the network.

THE EUROPEAN REWILDING NETWORK

Rewilding Europe has developed a new initiative, the European Rewilding Network, which aims to connect and unite rewilding initiatives and activities across Europe. A concise outline of the initiatives joining the European Rewilding Network will be included in an online database that will become publicly accessible. This network will facilitate knowledge and experience sharing for members and will also help generate more awareness of the projects. Rewilding Europe will facilitate the process through the online network, and will also help to develop training, courses and/or knowledge exchanges. The network will offer a platform to exchange 'hands-on' experience of bison conservation, tourism and business development. Rewilding Europe therefore invites bison initiatives to become part of the network and part of the rewilding movement.



STAFFAN WILDS MAND / REWILDING EUROPE

based tourism makes a much higher contribution. Carcasses of bison that died from natural causes and were left in the wild would make a more positive contribution to the overall ecosystem, feeding other species in the area, a particularly important source of food throughout winter and early spring. Furthermore natural selection is preferred above human selection in order to strengthen the genetic basis of the population.

Bison culled in 2004-2013 in the Bialowieza Forest (PL):

2004	36 (19 males, 17 females)
2005	38 (15, 23)
2006	30 (16, 14)
2007	28 (11, 17)
2008	23 (12, 11)
2009	30 (20, 10)
2010	18 (13, 5)
2011	18 (10, 8)
2012	20 (13, 7)
2013	21 (14, 7)
Total:	262 (143, 119)

GUIDING PRINCIPLES:

- For Rewilding Europe it is vital to create conservation partnerships with other organisations involved in the management of bison reintroductions in order to ensure a coordinated approach.
- Rewilding Europe advocates an approach whereby wild bison populations are allowed to grow to natural densities with minimal human management where possible; thus establishing wild human-independent and self-regulating populations. Stimulating high numbers of bison through setting targets for annual growth rates in each of the rewilding areas (a minimum of five) is a crucial strategy to safeguard the species.
- Rewilding Europe believes that culling is an unacceptable part of current European bison management and it will not form part of our approach. Instead a strong effort is needed to identify and prepare areas where these bison can be used for building new or additional wild populations.



3.5 RESEARCH AND TRAINING

Researchers Aleksandra Woloszyn-Galeza and Maciej Januszczak from the Carpathian Wildlife Research Station displaying ripe apples, a favourite food source for bison in autumn

The bison is a very well-researched animal; however, many of these studies have been carried out in commercial forests or on managed populations that are supplementary fed e.g. in the Bialowieza forest in Poland. The ecology of the species is therefore still not fully understood. The numbers of reviewed scientific publications is growing rapidly, yet only 20% of these papers are relevant to the conservation of European bison (Kerley and Knight 2010). Rewilding Europe understands the importance of cooperation with scientific institutes and universities and would like to offer the opportunity for students to research European bison ecology in rewilding areas. As Rewilding Europe will reintroduce bison both inside and outside its familiar forest habitats and in different ecoregions within its natural range, monitoring and research are essential to guide Rewilding Europe bison conservation activities. It will also help Rewilding Europe's bison projects serve as pilot projects for other bison reintroduction initiatives.

It is also important to have a clear understanding of health risks that threaten the species, as well as of the potential risk of spreading diseases to domestic livestock and vice versa. On-going research is therefore needed concerning diseases including parasites that affect European bison.

GUIDING PRINCIPLES:

- Wildlife management strategies, including reintroductions of bison, should be accompanied with sound science, research and adaptive management.
- Rewilding Europe will work with the scientific community in Europe – through partnerships with local scientific institutions and universities – to study and monitor the population dynamics of bison populations and support scientific publications thereof.

HUMAN-BISON CONFLICT

3.6

Current-day conflict between bison and humans generally relates to crop and forestry damage. Agricultural crop damage in Lithuania, where a herd of 61 bison live in a highly anthropogenic landscape, is indicated to be around several thousand euros annually (Linus Balčiauskas, personal communication, 2011). A recent study analysed depredation of farm crops by bison and other factors influencing the level of damage in the vicinity of two forest areas inhabited by bison in Bialowieza Forest and Knyszyn Forest (Hofman-Kaminska and Kowalczyk 2012). The majority of the crops damaged by bison were cereals (61%) in addition to hay (20%) and rape (13%). When compared to the availability of crops, bison strongly selected rape and rye in both regions (Hofman-Kaminska and Kowalczyk 2012). Between 2000 and 2010, the total compensation was €196,200. In 2011, 2012 and 2013 the yearly compensation was around €100,000 (Rafal Kowalczyk, personal communication, 2014). The level of damage and amount of compensation increased from year to year in both forests and was correlated with the number of bison. The majority of damage (57% of cases) was recorded in winter (December-March) but snow depth and temperature did not influence the frequency of damage. Incidences of damage were highest closest to woodland patches, with 69% of cases in Bialowieza Forest and 80% in Knyszyn Forest recorded closer than 0.5 km from the nearest woodland patch. Bison usually rest and ruminate in forested areas and select more dense stands with low visibility (Schneider *et al.* 2013). Bison therefore appear to prefer more diverse habitats, preferably using a mixture of open and forested areas. This should be taken into account when developing conservation management plans for European bison.

North-eastern Poland, which is inhabited by three bison populations (over 700 individuals in total), constitutes the core of the global bison population. Although the amount of compensation paid to farmers for bison damage in this area is increasing from year to year, in 2010 it cost around €90,000 out of an overall €13.7 million paid for crop damage by wild ungulates (mainly wild boar and red deer). Part of the reason for human-bison conflict was Poland's accession to the European Union, after which associated agricultural subsidies caused intensification of farmland activities in previously abandoned or less inten-

sively utilised fields and meadows adjacent to those occupied by bison (Hofman-Kaminska and Kowalczyk 2012).

In order to reduce damage to tree stands and farm crops, and to reduce migration out of the forest, bison in Bialowieza forest are regularly fed with hay and silage at several winter-feeding sites within the forest. However, 15-20% of bison still spend the winter outside of the forest in the neighbouring agricultural areas (Hofman-Kaminska and Kowalczyk 2012). In Knyszyn Forest, supplementary feeding is limited and bison only occasionally utilise one winter feeding site created in the forest. In late autumn, 90-100% of bison migrate out of the forest and utilise agricultural areas until spring, only occasionally returning to the forest (Krasinska and Krasinski 2007). Exact data on European bison damage to forestry are not available, although damage is usually concentrated around feeding places and considered low across forests as a whole (Hofman-Kaminska and Kowalczyk 2012).

With an increasing and expanding European population, instances of human-wildlife conflict are likely to increase and therefore careful management decisions must be taken, based on an understanding of the source of the conflict. Protective measures, such as electric wires around vulnerable crops, could be part of this strategy.

GUIDING PRINCIPLES:

- The mix of open and forest habitat in bison release areas should be carefully planned in a way to reduce human-bison conflict e.g. providing open areas that are not located near agricultural areas.
- If mitigation measures have been sufficiently applied and conflict still happens, compensation may be needed to mitigate or eliminate human-bison conflict.
- A robust insurance scheme is preferred over a compensation scheme.

3.7.1 NEW LOCAL ECONOMIES

Rewilding Europe aims to help create new jobs, income and business for the people who live in rewilding areas. Helping to establish strong and innovative nature-based (including bison-based) businesses across rewilding areas is therefore a core tenet of the initiative.

Economic development is often seen as a threat to nature, but if designed in a responsible way, it could offer new finance mechanisms for nature conservation. Rewilding Europe seeks to help develop a bold new economy based on using wildlife, wilderness and wild lands in new, creative ways, in which the European bison will play a crucial role. Rewilding Europe wants to explore rapidly evolving new markets such as nature-based tourism, which is growing at three times the rate of conventional tourism. For example, whilst farming in the Bialowieza Forest has nearly collapsed as an economic activity, eco-tourism is flourishing, with visitor numbers rising year on year, currently

around 140,000 visitors, which is contributing millions of euros to the local economy.

Bison reintroductions could also create work and jobs directly. Within the European bison projects of Rewilding Europe for example, local farmers will produce hay for the bison during their pre-release in the acclimatisation zone. Local tour operators could offer bison safaris and bison rangers could be recruited among local people. Local people could also be offered opportunities to run visitor-oriented businesses, including selling local products and guiding visitors. Rewilding Europe recognises that many wildlife and wilderness entrepreneurs in the rewilding areas will need investment and finance to grow and sustain their businesses. Rewilding Europe has therefore developed an investment fund (Rewilding Europe Capital) that allows for cheap loans and small grants for entrepreneurs that are willing to invest in rewilding enterprises across Europe's rewilding areas.

Bison rangers, recruited among the local community, are trained in ecology, bison management and guiding tourists





JOFF VANN DE VLASAKKER

However, not all people in the community can profit from the bison through ecotourism and in some regions the opportunities and/or infrastructure are not sufficient to develop eco-tourism. Although hunting is an integral part of society in many regions, Rewilding Europe does not recommend hunting of bison as a game species, for a number of reasons. First of all, the number of bison does not, in our view, allow for hunting of the species at this stage, where it is still considered as Vulnerable by the IUCN Red List. Rewilding Europe prefers to use all available bison for building viable populations in Europe, and increasing the distribution range of the species. At a certain point, which is far beyond the scope of this Rewilding Plan, when the European bison may be down-listed to a lower extinction risk, and has thus entered a safer and more favourable conservation status, bison hunting could be considered under strict regulations, e.g. only the culling of older bulls that no longer contribute towards reproduction. Meat could then be sold locally or left for scavenging.

Rewilding Europe will only support bison hunting if it is needed from a human-bison conflict/acceptance point of view. The EBCC accepts controlled culling as a conservation method. Rewilding Europe does see culling of older animals as a zotech-

nical action and does not see an ecological need to eliminate old animals as they have the same right to live in the rewilding areas as younger ones.

A very important negative effect of hunting is that it changes bison behaviour, altering the spatial distribution of the species, and strongly reducing their visibility for wildlife-watching tourists. Radio collaring will help bison rangers to track individuals and protect bison against poaching and illegal hunting.

The Tarcu mountains are one of the most scenic locations in Europe to view bison in their natural surroundings, with the potential to grow into a major tourist attraction to support the local, rural economy

GUIDING PRINCIPLES:

- Local people must benefit from bison conservation on the basis that if bison provide economic benefits, there should be more support for reintroducing them to the wild.
- Local people should receive training in order to be able to take part in monitoring and guided tours of bison.
- Rewilding Europe does not regard hunting of bison as opportune at this stage. Focus should be on improving the conservation status of the species through setting targets in growth rates and population size, as well as increasing its distribution range by establishing viable populations in different parts of Europe.

3.7.2 VISITOR MANAGEMENT

Offering people the opportunity to view free-ranging European bison should be an integral part of the rewilding project. Depending on the local circumstances, the acclimatisation zone and semi-wild reserve (re-wilding enclosure/zone)¹ could function as a visitor attraction, where guided tours could be developed, creating jobs and generating a direct income from the bison for local people. Due to the flight behaviour of bison and in order to avoid stress, visits to the acclimatisation zone and rewilding zone must be managed and controlled (e.g. safe distances of 50 m will be kept at all times)². As long as infrastructure is appropriately managed, visitors could experience true wilderness. Rewilding Europe therefore advocates a light weight design of bison infrastructure, out of the visitors' line of sight in order to enhance the wilderness aspect of bison viewing.

It is recommended that dominant female individuals in each bison group should be radio-collared prior to release into the wild in order to monitor the behaviour of the released animals and to support commercial 'wild' bison viewing. With guidance, bison can be viewed in a way that avoids disturbance, but still offers high quality observation experiences. Special dawn and dusk excursions could be organised, as well as snow tracking. Special bison hides could also be built at locations favoured by bison to offer wildlife photographers the opportunity to take photos of bison in a natural setting.

GUIDING PRINCIPLE:

- Wildlife tourism and other visitor activities should contribute towards bison conservation and not constitute a new threat, and must therefore be organised in a way that does not disturb bison or alter their behaviour in ways that are detrimental to their sustainable existence.

3.7.3 PUBLIC ENGAGEMENT, EDUCATION AND COMMUNICATION

Public involvement is essential for effective wildlife management efforts. Establishing the beliefs, perceptions, attitudes and values of stakeholders and interest groups is the first step in efforts to gain an understanding about the opinions and knowledge of different interest groups, and consequently to be able to integrate this information into management, communication, and education strategies. Stakeholders and public groups increasingly seek participation in resource and wildlife management decisions (Chase, Siemer and Decker 2002; Chase, Decker and Lauber 2004; Raik, Decker and Siemer 2006). In many areas around the world, and failure to properly address the views and values of the full diversity of relevant stakeholder groups and members of the public has resulted

¹ The acclimatisation zone is a 5–20 ha enclosure that bison will stay in immediately following arrival at a new site and the semi-wild reserve is the first proper 'release' area of at least 100 ha.

² Critical range for bison attacks is 1–40 m (Kowalczyk, in prep.)



in opposition to important resource and wildlife management efforts (Miller and McGee 2001). Wildlife managers, for their part, acknowledge the rights and influence of concerned and affected members of the public and also recognise that successful public involvement efforts can reduce conflict, build trust and credibility between managers and the public (Bath and Enck 2003; Lafon *et al.* 2004), and forestall litigation by those who wish their voice to be heard (Lawrence and Deagen 2001).

European bison are currently only living in the Rewilding Europe project area in the Eastern Carpathians; in all other project areas people are (as in the rest of Europe) unfamiliar with living near bison. Educating people about the ecology and role of the European bison in European ecosystems is a key element of bison conservation. Many methods are available to do this, and the specific approach will depend on the local context. However, these should ideally embrace social-media and new technologies in order to obtain a wide reach and appeal to a wide audience. Co-operation with schools should also be sought and field visits should become an integral part of the biology curriculum of local schools. Part of working with schools should therefore involve the development and provision of special learning material on the European bison and rewilding.

Local communication regarding bison conservation will be an integral part of supporting education and outreach elements of the project.

Wider methods of advertising bison reintroduction projects will also be vital in attracting international visitors to the project areas. Release events should be an opportunity to involve local people in bison conservation. Concerns of local people towards bison must be directly addressed in order for communities to feel engaged and supportive of rewilding initiatives.

Rewilding Europe will use different methods of communicating to different stakeholders/target audiences, which should be carried out by the appropriate partners. The majority of Europeans, especially in Western Europe, have never heard of the European bison, and therefore one of Rewilding Europe's aims will be to make the European bison an important conservation flagship species in Europe, and to encourage its partners to do the same.

GUIDING PRINCIPLES:

- Local people must be engaged from the outset in order for reintroductions to be accepted and sustained in the long term.
- It is important to educate children at an early stage about European bison and the importance of maintaining viable ecosystems for wildlife.
- Local ownership over bison reintroduction projects needs to be felt and valued.
- It is important to promote the species and its role in the ecosystem.





4. BISON STRATEGY AND ACTIONS 2014–2024

The following section lays out Rewilding Europe's overall strategy for the conservation of European bison. Specific action points are further explained in the table below.

VISION:

Viable populations of free-ranging herds of bison are established and restored across Europe and are integrated into Europe's landscapes alongside human populations, thereby improving the long-term conservation status of this species.

Goal A. Viable and self-sustaining populations of bison across Europe in rewilded and connected habitat.

Goal B. Long-term protection and support for free-ranging European bison achieved by legislation, community outreach, education and tourism.

OBJECTIVES

1. **Creation of conservation partnerships:** effective coordination with zoos, the European bison conservation organisations and other rewilding initiatives to facilitate knowledge exchange and sourcing of bison for establishing free-roaming and wild-living herds.
2. **Effective planning and training:** carry out feasibility studies prior to reintroductions and re-stockings, and develop best-practice guidance and provide training to optimise chances of success.
3. **Secure large areas of suitable habitat:** a minimum of (and ideally more than) 10,000 ha that can be used for rewilding and for establishing viable populations across Europe, that are connected with potential additional habitat in a wider landscape.
4. **Bison reintroductions and re-stockings:** establish viable populations of European bison into areas mentioned under objective 3, with a founder population of at least 100 animals, but which could hold populations of at least 400 animals.
5. **Monitoring species and ecosystem interactions:** monitor population dynamics of bison in the rewilding areas, and the impact of bison and other keystone species in the ecosystem.
6. **Conservation research and innovation:** use and disseminate up-to-date scientific research into European bison ecology, genetics and management to enhance the effectiveness of bison conservation and management

OBJECTIVES

7. **Bison protection:** engage with and assist bodies responsible for protection of bison from illegal poaching and exploitation.
8. **International and national policy:** engage with and advise relevant policy-making and legislative institutions to improve and create an enabling environment for European bison conservation.
9. **Public engagement and education:** promote and showcase the European bison as a keystone species in European landscapes and show benefits of European bison conservation within both local and wider communities near and outside the reintroduction areas.
10. **Economic development:** create sustainable economic benefits from bison- and nature-based business initiatives such as tourism.
11. **European awareness:** engage with policy makers, conservation practitioners and general public Europe-wide to increase awareness about the status of the European bison.
12. **Review Rewilding Plan:** ensure Rewilding Europe's Bison Rewilding Plan is kept up-to-date and relevant as a living document (including a five-year review in 2019).

OBJECTIVE	ACTION	RESULT
1. Create conservation partnerships	1.1 Work to establish partnerships with EBCC and EAZA to work together implementing (elements of) this Bison Rewilding Plan.	Cooperation agreements signed with EBCC and EAZA. Active participation in EBCC fora of Rewilding Europe staff working with bison.
	1.2 Identify key partners from NGOs, government, private sector, landowners and relevant research organisations to establish partnerships and networks.	Agreements with key partners for bison programmes in place in Southern Carpathians (2014), Eastern Carpathians (2014), Velebit (2014–2015), Rhodope Mountains (2014–2015) and Oder Delta (2015–2016).
	1.3 Use the European Wildlife Bank (EWB) to enable more efficient coordination between ‘supply and demand’ of bison.	EWB established and running by 2013 and used for provision of bison.
	1.4 Use the European Rewilding Network (ERN) to connect and unite different bison rewilding initiatives across Europe, and support sharing of expertise and lessons learnt.	ERN established in 2013, with at least five extra bison initiatives in 2015 and 10 in 2020.
2. Effective planning and training	2.1 Develop and update best practice guidelines for bison reintroduction and management.	Guidelines for reintroductions available in 2014. Reviewed and updated at least every two years.
	2.2 Tailor-made planning to be carried out prior to all introductions, alongside sensitisation and generating buy-in of key stakeholders and decision makers.	Tailor-made project planning available for Southern Carpathians (2014), Eastern Carpathians (2014), Velebit (2014–2015), Rhodope Mountains (2014–2015) and Oder Delta (2015–2016).
	2.3 Train veterinarians linked to reintroduction projects in European bison handling and tranquilisation where necessary.	First wave of qualified veterinarians in Southern Carpathians (2014), Eastern Carpathians (2014), Velebit (2014–2015), Rhodope Mountains (2014–2015) and Oder Delta (2015–2016).
	2.4 Develop narcotic exposure response protocol for bison, as a living document.	Narcotic exposure response protocol available by 2015.
	2.5 Train all staff involved in bison reintroductions in execution of narcotic exposure response protocol.	First wave of local staff trained in Southern Carpathians (2014), Eastern Carpathians (2014), Velebit (2014–2015), Rhodope Mountains (2014–2015) and Oder Delta (2015–2016).
	2.6 Develop individual roadmap for each release with clear guidelines.	Roadmaps for releases available in Southern Carpathians (2014), Eastern Carpathians (2014), Velebit (2014–2015), Rhodope Mountains (2014–2015) and Oder Delta (2015–2016).
3. Secure large areas of suitable habitat	3.1 Obtain at least five rewilding areas suitable for a viable bison population across Europe.	Five suitable areas for viable populations available by 2015.
	3.2 Integrate different ecosystems, landscapes and topography e.g. river valleys and higher forests, into rewilding areas to allow natural migration and movement of bison.	By 2022, in all five areas available under 3.1, a viable population of bison can complete its lifecycle without additional feeding in winter.
	3.3 Connect spatial and seasonal (sub-) habitats to protect herds of bison during their complete life cycle.	In all five areas, seasonal habitats included within the bison range.

OBJECTIVE	ACTION	RESULT
4. Bison reintroductions and re-stockings	4.1 Establish at least five new herds (> 100 individuals) in all selected reintroduction areas.	At least 500 bison in the five rewilding areas present by 2022.
	4.2 Create at least one metapopulation (> 500 individuals) in the Southern Carpathians.	Metapopulation of > 500 individuals in Southern Carpathians established by 2025.
	4.3 Lead bison out of danger of extinction.	European bison population living in the wild increased from 2,371 animals (2013) to > 3,500 in 2018 and > 5,000 in 2022.
5. Monitoring species and ecosystem interactions	5.1 Develop monitoring protocol to monitor impact of bison on ecosystems.	Monitoring protocol developed and ready to use in Southern Carpathians (2014), Eastern Carpathians (2014), Velebit (2014–2015), Rhodope Mountains (2014–2015) and Oder Delta (2015–2016).
	5.2 Develop monitoring protocol to monitor impact of carnivores on bison populations.	Monitoring protocol available in 2014; rolled out across all rewilding sites by 2020.
	5.3 Establish training of relevant stakeholders (NGOs/local community members) in monitoring techniques for European bison and other relevant large mammal species.	First wave of monitoring training carried out in Southern Carpathians (2014), Eastern Carpathians (2014), Velebit (2014–2015), Rhodope Mountains (2014–2015) and Oder Delta (2015–2016).
	5.4 Monitor impact of carnivores on bison population within all reintroduction areas.	Ongoing from start of reintroduction, and results of monitoring to inform adaptive management of bison.
	5.5 Monitor impact of bison on ecosystem (soil and vegetation structure and related biodiversity).	Ongoing from start of reintroduction, and results of monitoring to inform adaptive management of bison.
	5.6 Carry out applied scientific research to inform bison management and impact on ecosystems.	At least one article per year published on aspects of bison management, reintroduction, monitoring or impact on ecosystems per rewilding area, starting in 2015.
6. Conservation research and innovation	6.1 Establish research projects following bison reintroductions.	At least one research project pertinent to bison conservation should be established in each rewilding area by 2015.
	6.2 Cooperate with universities to offer students the opportunity to research European bison ecology in rewilding areas.	In each of the five areas, students conducting research under supervision of bison experts.
	6.3 Maintain database of novel research insights into genetics, habitat use, management and historical range of bison, and exchange information with EBCC.	Database operational and publicly available by 2015.
	6.4 Disseminate new advances in bison conservation via the scientific literature/conferences.	At least one article/year published on aspects of rewilding bison starting in 2015.
	6.5 Co-operate with EBCC and other partners (e.g. IUCN bison specialist group, EAZA, EBPB) on genetic improvement of the populations.	Reintroduction or restocking of bison as proposed in the Bison Rewilding Plan in line with IUCN Guidelines for reintroductions, and following EBCC principles where possible and appropriate.

OBJECTIVE	ACTION	RESULT
7. Bison protection	7.1 Encourage range states to ensure legal protection for European bison, with effective sanctions in place to deter illegal poaching.	Workshop on development of effective protection held by 2020, involving representatives of all European bison range states.
	7.2 Encourage range states to ensure protection of large carnivores (wolves, lynx, bear) is in place in all bison reintroduction areas	Protection of large carnivores improved in five rewilding areas to allow natural predation.
	7.3 Rewilding Europe to develop formalised response in the case of poaching of bison in any of its rewilding areas.	Anti-poaching strategy available in 2015.
	7.4 Bison rangers to be recruited in all bison reintroduction areas, preferably from local people.	First wave of rangers recruited in Southern Carpathians (2014), Eastern Carpathians (2014), Velebit (2014–2015), Rhodope Mountains (2014–2015) and Oder Delta (2015–2016).
8. International and national policy	8.1 Rewilding Europe to strengthen their links with the IUCN Bison Specialist Group.	Annual meetings held with the IUCN Bison Specialist Group to align European bison protection and rewilding activities.
	8.2 Encourage all governments within the natural range of European bison to develop bison rewilding plans by 2020.	National Bison Rewilding Plans operational in Romania (2015), Poland (2016), Bulgaria (2017), Germany (2018) and Croatia (2019).
9. Public engagement and education	9.1 Organise field trips for local schools to visit bison rewilding areas.	At least five school classes per year visiting the bison projects in Southern Carpathians (as of 2014), Eastern Carpathians (as of 2015), Velebit (as of 2015–2016), Thracian Mountains (as of 2015) and Odra Delta (as of 2015–2016).
	9.2. Education on European bison and rewilding built into the curriculum of local schools.	Integration into curriculum, with tailor-made materials, ready and disseminated in Southern Carpathians (2014), Eastern Carpathians (2015), Velebit (2015–2016), Thracian Mountains (2015) and Odra Delta (2015–2016).
	9.3 Develop educational materials for and with local schools on European bison and rewilding.	Local schools actively using bison and rewilding education materials.
	9.4 Train teachers in European bison ecology and rewilding.	First wave of teacher training completed in Southern Carpathians (2014), Eastern Carpathians (2015), Velebit (2015–2016), Thracian Mountains (2015) and Odra Delta (2015–2016).
	9.5 Participation of local community in all bison release events.	At least one press release and one local radio PR publicising release events in local area.
	9.6 Establish annual 'Bison day' in all rewilding areas to promote conservation work with local communities.	Bison day established in Southern Carpathians (2014), Eastern Carpathians (2015), Velebit (2015–2016), Thracian Mountains (2015) and Odra Delta (2015–2016).
	9.7. Develop a communication strategy for bison rewilding.	Communication strategy, with special attention to communication with local people, available in Southern Carpathians (2014), Eastern Carpathians (2015), Velebit (2015–2016), Thracian Mountains (2015) and Odra Delta (2015–2016).

OBJECTIVE	ACTION	RESULT
10. Economic development	10.1 Develop Rewilding Europe Capital (REC) to invest in conservation-based businesses across Europe's rewilding bison areas.	REC supporting at least one bison related business case/area in Southern Carpathians (2014), Eastern Carpathians (2015), Velebit (2015–2016), Rhodope Mountains (2015) and Oder Delta (2015–2016).
	10.2 Work with local tour operators to establish paid guided tours of rewilding bison areas, recruiting local people.	Minimum of one paid guided tour outfit operational in Southern Carpathians (2014), Eastern Carpathians (2015), Velebit (2015–2016), Rhodope Mountains (2015) and Oder Delta (2015–2016).
	10.3 Promote bison-related tourism in rewilding areas.	At least 500 extra tourists/year coming to the bison projects in Southern Carpathians (as of 2014), Eastern Carpathians (2015), Velebit (2015–2016), Rhodope Mountains (2015) and Oder Delta (2015–2016).
	10.4 Develop training materials for e.g. rangers, tour guides that are being employed as part of the bison rewilding team in a local area.	Minimum of three rangers to be trained per rewilding area. First wave of rangers and tour guides trained, with tailor-made materials, in Southern Carpathians (2014), Eastern Carpathians (2015), Velebit (2015–2016), Rhodope Mountains (2015) and Oder Delta (2015–2016).
	10.5 Train bison rangers and tour guides in all local rewilding areas.	Minimum of two bison rangers and two tour guides trained and active in each rewilding area.
	10.6 Investigate potential for limited trophy hunting of European bison.	Study on hunting available at the latest in 2018.
11. European awareness	11.1 Make wider audience in Europe aware of the vulnerable position of European bison and of the strategy of Rewilding Europe to improve this.	As of 2014, at least 10 media outlets per year related to the rewilding of European bison, with an outreach of at least 10 million people per year.
12. Review Rewilding Plan	12.1 Review and update Rewilding Europe's Bison Rewilding Plan.	Progress towards achieving rewilding plan to be reviewed annually, with a major five-year review in 2019. Rewilding plan to be updated and republished by 2025.

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ANNEX: EUROPEAN BISON REINTRODUCTION AND MANAGEMENT GUIDELINES

INTRODUCTION

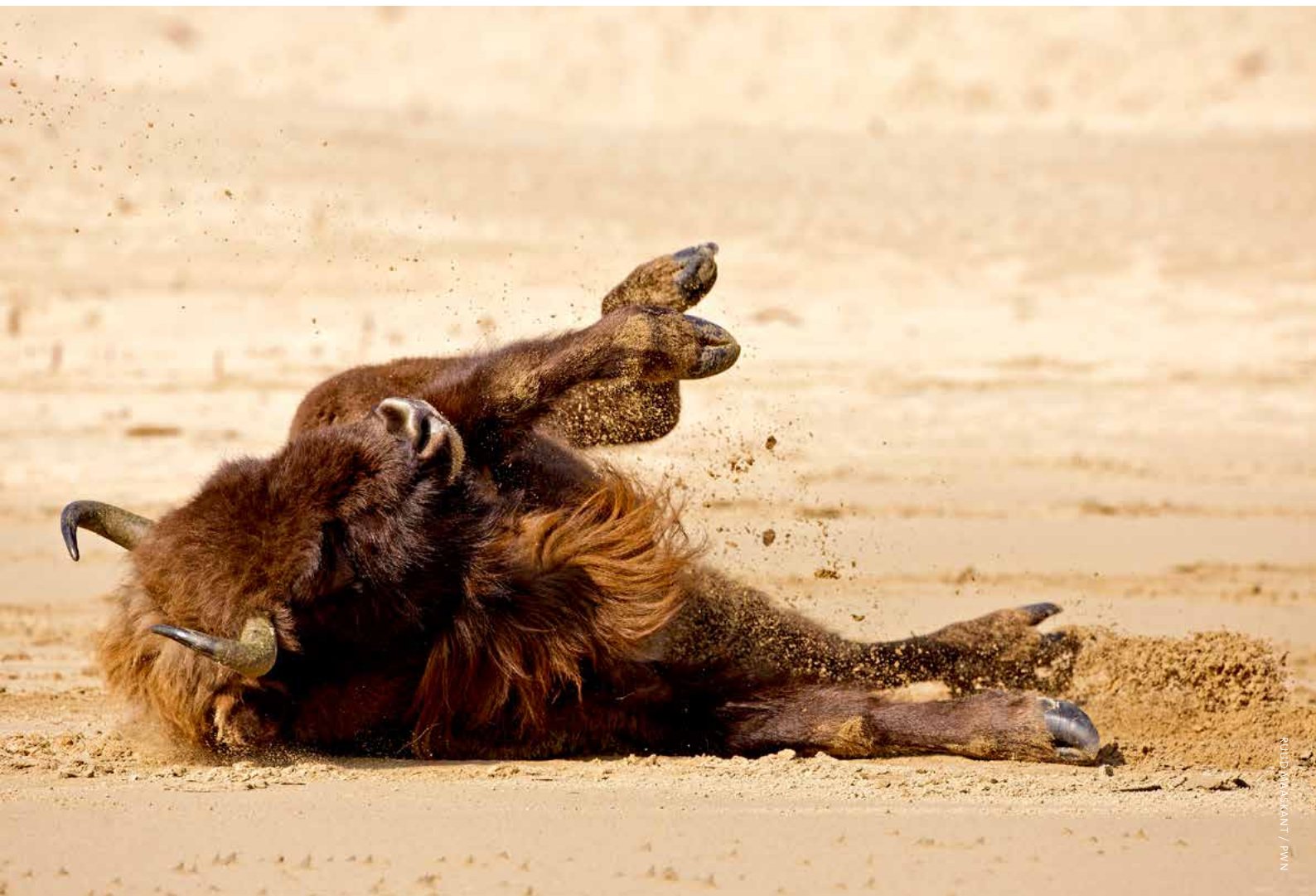
The challenge for Rewilding Europe is to ensure the return and survival of European bison in human-dominated landscapes. Since these animals are large, visible and can cause damage, their re-introduction is perceived, in general, as controversial. Despite the on-going land abandonment the rural areas remain human dominated. Much land is privately owned and there remains a lot of local interest for use of the land besides agriculture e.g. hunting, use of summer houses, mushroom picking etc. Therefore, the success of a bison reintroduction depends very much on the acceptance of the local people, an element that has been neglected in the past.

In the past, bison conservation planning has focused predominantly on forest habitat. This was related to ecological knowledge at the time but also strongly influenced by landownership. Forests are usually under state administration while open areas are either private or communal land and grazed by

domestic livestock. Given the evidence available for a wider tolerance of habitats, other habitats for bison should be considered. The overall quality of the habitat, especially the diversity of habitats and ecosystems at new planned re-introduction sites must also be scoped. Finally good preparation and a roadmap for the release itself are of great importance in ensuring a successful reintroduction and every reintroduction should be accompanied with a well-planned monitoring programme.

The local bison reintroduction team, in cooperation with the local people and/or local authorities, should look for opportunities to find a suitable site that best fits the parameters of the project; is available, and has support, both from the local community and the local authorities.

The following reintroduction guidelines are founded on the guiding principles which are outlined in the 'Bison Rewilding Plan'.



1. PLANNING THE REINTRODUCTION AND RELEASE INFRASTRUCTURE

1.1 HABITAT CRITERIA AND SITE SELECTION

European bison are not highly specialist with regards to habitat; they thrive almost anywhere as long as they can graze and browse, with some exceptions e.g. raised bogs, marshlands, alpine zones etc. Close co-operation with forest services can help keep tree damage to a minimum. In the Rothaargebirge project in Germany for example, some trees were felled when browsing was observed. It reduced the browsing of the standing trees as the bison preferred the felled, horizontal trees compared to the standing, vertical trees. (Röhl 2013, personal communication). Good site selection should also minimise the risks of damage to agriculture. As in most rewilding areas where agriculture is marginal, adaptive management e.g. establishing a compensation system or using movable or permanent fences can prevent damage. Arable fields can be easily protected against bison with electric fences. Prior to selection of reintroduction sites, protocols should be established for the event of bison damage to agricultural, forestry.

The following factors should be considered when selecting sites for bison reintroductions:

- As an animal with a large home range, the **size** of the habitat is a key element. On average the home range for a bison population is 10,000 ha and should thus be considered as minimum area for a 'true' reintroduction for bison living in the wild.
- **Topography**: because of their physical build and weight bison cannot handle wet conditions or gradients that are too steep. The exact maximum gradient is not known, however in Russia bison occur at high altitudes, up to 2,700 m (pers. communication, Sipko 2014). The position of the slope is also important especially in winter, when northern slopes have much higher snow fall than southern slopes.
- Bison are large animals with thick fur, even in summer, and for those reasons cannot cope with **heat** very well. Therefore areas that become too hot in the summer for long periods (several months > 30°C) are not suitable.
- Bison can cope quite well with deep snow cover, even though some authors claim that > 50 cm is the maximum snow cover (Heptner *et al.* 1966). It has been observed that bison can find food under deeper snow layers. However, **snow cover** and especially its duration can be a limiting factor,

as well as long periods of frozen conditions when grasses are not available and bison must be able to switch to browsing. Thus, snow cover is related to the vegetation and its availability.

- If the topographical and climatic conditions are appropriate for the European bison, then the **vegetation** in natural circumstances will generally be favourable too, particularly since bison have no specific requirements provided there are sufficient grasses, herbs, bushes and trees for grazing and browsing. Several studies have shown that European bison eat more than 200 plant species. The area should contain sufficient natural meadows and deciduous forest with a good and varied vertical and horizontal structure.
- As a species that appears to prefer mosaic habitat in forested and open areas, **connectivity** between different habitat types will be important to consider.
- As a bovine that is susceptible to all **bovine diseases**, the presence of livestock does put the bison at extra risk, particularly where livestock is known to carry bovine diseases. This risk is higher in areas bordering non-EU countries due to national veterinary regulations or the lack thereof. Having said this, recent bovine disease outbreaks have occurred in Western Europe where, despite health regulations, factory farming and the large scale of domestic animal movements can cause risks to the bison. Releasing substitutes for the aurochs in the same area as European bison should not cause extra risks if the founder animals have all been tested for bovine diseases.
- **Land ownership** and **land-use** relates to the conflict potential. Large state-owned areas are preferable, especially if they include protected areas. It is important to note that crops such as cereals, hay and rape may be particularly vulnerable to bison grazing.
- **Hunting** is not a limiting activity in areas for bison reintroduction as long as bison are not actively hunted themselves. However, hunting should not disrupt bison behaviour, which may affect its habitat use and visibility for tourists.
- **Illegal hunting** and **poaching** are serious threats for the European bison and should be prevented.

PUBLIC INVOLVEMENT

1.2

A reintroduction project always deals with a species and a human component. The species component is generally the 'easy' component to assess and manage. The human component is generally much harder to manage. In the past, people were rarely considered an important part of the success of a reintroduction and were therefore excluded from feasibility studies. We now understand that public involvement and understanding of the social-economic aspects and attitudes should be a key element of any feasibility study for a re-introduction that might affect local people.

Human Dimensions of Wildlife Management (HDWM) studies provide an excellent method to gather information in a scientific way in order to understand the attitudes of stakeholders (from politicians to local people) towards the re-introduction of bison (Bath and Decker 2010; Decker 2013). It is also useful for understanding the socio-economic context of the project area, including local people's needs and motivations. This information can then be integrated in developing the socio-economic elements of the reintroduction such as communication, education and economic development.

It is very important to involve authorities on a national and local level in the early planning process in order to gain support and understand possible restrictions, particularly as each country has different requirements regarding re-introductions. Some countries are familiar with bison re-introductions e.g. Romania, Germany, Slovakia which should help new applications in these countries.

After the site selection and an HDWM study, communication should start as soon as possible and will be a key element for project success. Both the content and delivery of communication are important. The communicators should speak the 'same language' and should be perceived as reliable. The Rothaargebirge is a good example where a local major, a local politician and a local farmer all played an important role in gaining confidence and support from the local community for the project. Conversely, in Poloniny NP in Slovakia the government was the main communicator but was perceived as unreliable related to an earlier land expropriation.

'SOFT-RELEASE' INFRASTRUCTURE DEVELOPMENT

1.3

Rewilding Europe will use the method of 'soft-release' for restocking and introductions, where animals are first given time to acclimatise to a new area (instead of 'hard-release' in which animals are directly released into the wild). In the wild, animals have their first contact with predators in the presence of parents, which provide them with protection and survival skills. Individuals bred in captivity lack these survival skills, so 'soft' release methods are important for enabling animals to adapt to the local circumstances and to acquire the necessary survival skills before they are released into the wild.

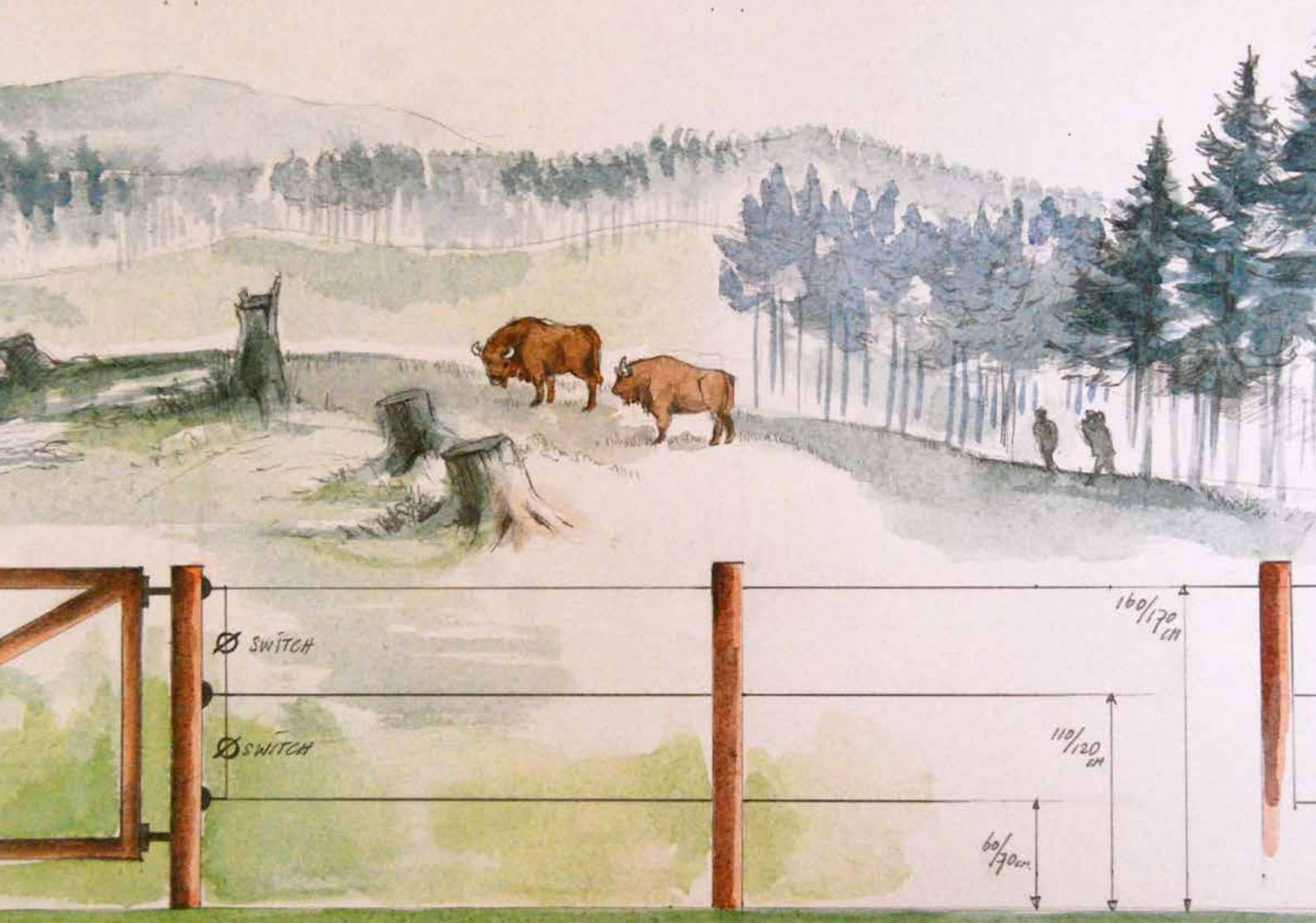
Even from captive situations, bison can undergo enormous amounts of stress following movement from one location to another. They often drop weight and become immunosuppressed and need extra veterinary care. The stress factors include:

- Social stress, from being taken out of their 'safe' social structure;
- Tranquilization stress: the body takes a long time to recover from tranquilisation;
- Transport stress: bison are unfamiliar with being transported and this can cause a lot of stress;

- Habitat stress: the animals arrive in a different habitat, especially animals that come from small enclosures;
- Food stress: the diet of the bison will change so the bacterial flora in their intestines will need to adapt;
- Climatic stress: the climate may be quite different from their original location.

It can take animals more than several months to recover and adapt to new conditions, and they should be allowed to fully recover before being released into the wild. Animals should therefore be brought to the acclimatisation zone several months prior to release, preferably at the beginning of the growing season. The 'soft' strategy leads to a higher rate of success as it allows the animals to recover from the above stress factors under supervised conditions, it provides access to additional food, protection from poaching and, if needed, extra veterinary care.

The disadvantage of the 'soft' release method is that pre-release infrastructure needs to be built (ideally in the preparatory phase), which involves additional costs. However, it is likely to



Electric wires for areas with high snowcover

be used over several years as new founder groups of around ten animals per year will be brought in for a soft release to broaden the gene pool and to increase bison numbers, meaning the facilities for the acclimatisation zone/semi-wild reserve will be used for a minimum period of ten years. By giving it an additional function as a tourist attraction, costs can be lowered and even additional income generated. Within the Rewilding Europe programme the following release system will be utilised to guarantee the well-being of the bison.

After its journey to the release site, the bison will first be released into a so-called acclimatisation zone. This area is 10–15 ha and includes a handling area in which the animals can safely be tranquilised. The handling area consists of a flat area of approximately 40 x 20 m, with a solid surface. Two gates provide easy access to the area,

both for bison as well as vehicles/tractors. The whole handling area will have a 2m high wooden fence. All pre-release infrastructure must be built inside the release area and be accessible by truck. In the acclimatisation zone the bison can recover from stress and adapt to their new surroundings. They can also be brought into the handling area when they need treatment. The acclimatisation zone will also have an important 'training' function as bison may have come from a diverse range of environments and enclosures. The acclimatisation zone will be fenced with electric fencing (two wires and if needed an additional ground wire or three electric wires, independently charged in area with high snow cover) with a 'back-up' of a 'deer fence' of 2m high, in order to help prepare bison for the subsequent semi-wild reserve (of at least 100 ha) which will be surrounded by only electric fencing.

2. THE FOUNDER GROUP

A good social and organisational structure is important prior to the release into the wild for securing protection against predators and establishing dominance and position in the herd. For this reason young animals should always be accompanied by adult animals in releases. This provides social stability to the herd, gives the young animals survival skills and helps protect them from predators. In turn this will help reduce stress levels, increase reproductive success and enable survival behaviours to be passed on. Social interactions also affect foraging behaviour, which may influence how bison use landscapes.

It is also important that the founder population represents the maximum genetic variability possible. The individuals that form the founder group will therefore come from different institutions. Following Frankham *et al.* (1998) a minimum of 50 animals is needed to avoid inbreeding depression and > 500 are required to retain evolutionary potential and ensure overall genetic variability. Decreased genetic variability resulting

from inbreeding depression can lead to negative consequences such as lowered fecundity, reduced growth, lower breeding success and greater susceptibility to disease. Ideally 50 unrelated bison should be used to form the founding group. However in the case of the bison it is unlikely this can be achieved due to the history of the species and also for practical reasons within an acceptable financial budget. For practical reasons an effective alternative is to introduce several young unrelated bulls instead of one dominant adult male. If the founder group of animals has to be small for practical reasons (e.g. due to limited size of the acclimatisation zone /semi-wild reserve area) and there is only one dominant bull, this individual can be replaced every generation to prevent inbreeding.

Rewilding Europe wants to start with an initial founder group of 10–20 animals, followed with yearly herd supplementations, with a minimum of 10 animals on average per year over a 10 year period. Rewilding Europe will primarily make



use of young animals two to four years of age because of their easier availability, greater ease in handling and managing them and their ability to adapt to the local circumstances. It is also easier to introduce younger animals to the release site. Several adult animals (females) will be kept with the younger individuals for 'social stability' and to teach them survival skills. Individual behaviour will be monitored and based on this it will be decided if the founder adult animals will be released with the young animals, which will by that time have reached an adult age and will be 'experienced' and have formed a good social bond. The male to female ratio of the founder group will depend on the availability of animals, but will not exceed 50% in favour of males. A ratio in favour of more females is preferred as it results in a greater rate of population increase. Although an even gender ratio is closest to that of wild populations, it can often be slightly in favour of females due to higher mortality among males. If the ratio is uneven in favour of males, this risks small groups splitting off and migrating for large distances, which would make monitoring and management more complex.

The preferred (minimum) composition of the founder group is therefore three young males (under four years old) and six females, of which a minimum of two are adults that can take on a leading role and add stability and experience to the group.

The mixed group will first be released in the acclimatisation zone at the same time or with a minimum as possible time (< 10 days) in between each release. Due to the large size it is possible to use the semi-wild release areas (rewilding zone) in mixed-species settings, to combine with reintroduction of other large herbivores, e.g. red deer, as there is adequate space for animals to voluntarily separate themselves when desired or necessary. However, extra hayfeeders need to be provided to avoid competition for food.

In the wild, bison are both gregarious and non-territorial. Male reproductive success is based on dominance over other males rather than dominance at a particular site. Therefore adult and sub-adult bulls should not be placed in the acclimatisation zone as adult bulls may drive out or attack young males when they begin to exhibit secondary sexual characteristics.

2.1 FURTHER ADDITIONS TO THE FOUNDER GROUP

During the reintroduction project new groups will be added to the founder group. This founder group will gradually establish and form bonds. New herd members should, preferably, be given a period of time, generally several weeks, that allows them to gradually familiarise themselves with the existing group before progressing to full physical contact. Animals can be separated between the acclimatisation zone and semi-wild reserve, with the 'newcomers' in the former and the 'old-timers' in the latter area. New Animals should never be added to the group in the acclimatisation zone. With the above exception if there is maximum 10 days in between when the social hierarchy has not been established yet between the members of the first group.

Several years after the first releases, when young bulls have reached adulthood, adult males can also be added to the herd to further broaden the gene

pool. Rewilding Europe wants to avoid further culling of bison and therefore males, young and old, will be accepted for re-introduction, if adequate funding can be found for their transportation.

It is estimated that roughly ten animals per year will be available for each bison reintroduction area. With an annual re-stock of ten animals and an expected annual growth of 20% (based on several assumptions, age of founder animals, annual deaths etc.) this should result in a population of over 175 animals after ten years over a minimum of five sites. This is the minimum population growth that Rewilding Europe is striving for. Additional stocking could also be increased if more animals become available, there are sufficient financial resources, the initial population is healthy and there is continued local support. This would in turn further increase the annual population growth rate.

3. BISON PRE-RELEASE MANAGEMENT IN THE ACCLIMATISATION ZONE AND SEMI-WILD RESERVE

During the acclimatisation period, the animals are given the opportunity, under close surveillance, to recover from the stress of capture and transport and adjust to their new surroundings. They should be allowed to enter the handling area at their own pace and should not be forced into it, as this may cause unnecessary stress. The gates of the handling area should be regularly closed to habituate the animals to this procedure.

In general, the European bison, as a herbivore, herd and prey species, does not present a risk to people. However, it is a large, powerful animal and if it is in a stressful situation and unable to take flight, it will defend itself; like almost every animal. Great

care must therefore be taken with handling bison in captivity, especially in small areas e.g. the handling area. Although bison can become quite habituated to human presence and can give the appearance of being docile, it should be noted that they can become aggressive and dangerous when stressed.

Although Rewilding Europe will aim to minimise interactions with bison at all stages of a release, there will be a certain amount of handling in the pre-release phases (during transportation and in the acclimatisation zone and semi-wild reserve) which will be unavoidable, but for which we have therefore established the following guidelines.

TRANSPORT

Transportation of European bison traditionally takes place using wooden boxes; however, these have a few disadvantages:

- Each box needs to be made individually to fit the animal, as it cannot be too small, but likewise, if the box is too big the animal can turn, which can be fatal as it can get stuck.
- The bison can easily become overheated in the box.
- The boxes do not provide the animal with much space, and therefore it is unsuitable for long journeys. Animals can remain in the box for a maximum of two days.
- The boxes are expensive to produce.
- It is difficult to observe the animal once in the box.

Due to the size of the European bison, the use of a crate is generally not recommended for transporting bison; rather, a trailer is preferable. When transporting bison in a trailer, animals should be single-stalled and compartments should be portioned in such a way that the animal has enough room to lie down, stand up and turn around easily. Too much space allows the animal to produce speed, potentially injuring itself as well as being thrown through the compartment during extreme breaking of the truck etc.

Food and water must be provided for animals during transit. Because animals are likely to be excitable or even aggressive, it is best to affix a water container in the compartment ahead of time. Bedding, ideally straw, should be placed in the trailer in order to provide traction, warmth during

cold weather, absorption of urine and faeces, and to reduce abrasions. Transport of bison in either hot or cold extremes is not recommended. While it is possible to improve cold conditions by providing ample bedding in a trailer, the transport of bison should not be undertaken at prolonged temperatures below 0°C. Journeys should also not be undertaken at ambient temperatures above 25°C as the temperature inside a trailer can be several degrees warmer and rapidly increase if the trailer is stationary. As such, trailers should never be left immobile for prolonged periods of time in direct sunlight. A darkened trailer is most appropriate for transport of bison, as this reduces the effects of visual stimuli. Because capture and transport are stressful events, ambient noise during transport should be minimised.

Although in general, bison should be in single stalls within a trailer, it is possible to place a cow and its calf in the same compartment, depending on their size and temperament. Young animals under two years of age and from the same herd may also be transported in one compartment, however single stalls are preferred. It is important to consider the accessibility for a handler/veterinarian during transport and for personnel to be able to clearly see the animal during transport in order to check its condition. A handler will need to have access to a small opening in order to replenish water and/or food, as well as to administer drugs (narcotic, reversal agents, tranquilisers, etc.) or medical treatment while the animal is confined.

3.1



Bison are best transported in individual compartments, instead of wooden boxes

Bison can tolerate a cross-country trip in a transport trailer of up to five days, but of course shorter transportation durations are preferred. Bison tend to lie down during transport and can develop lameness after lying for extended periods so it is important to encourage them to their feet two (minimum) to three times a day with

regular feeding and watering intervals. Following transport, the bison will be released into the acclimatisation zone by giving them the time to step out of the transporter under calm conditions. Bedding material (e.g straw) should be placed on the ramp, to avoid the bison from seeing it as a barrier.

3.2 TRANQUILISATION

Capture and restraint of European bison is generally undertaken using chemical immobilisation, which should be done by an experienced veterinarian with experience on bison tranquilisation. If the veterinarian associated to the project is not experienced with bison he or she should receive training first. The particular drug combination will depend on availability and preference of the veterinarian. Some drugs include extremely potent semi-synthetic morphine derivatives and must be handled with extreme caution. Human exposure to even small amounts of these drugs can result in the very rapid onset of respiratory arrest. These drugs can be absorbed through mucous membranes, such as

the mouth and eyes, as well as by accidental needle puncture. Personnel must therefore be adequately protected during dart preparation and handling of the animal after the administration of the dart, potentially including latex or rubber gloves, safety glasses or full-face shields, long sleeves and other precautions as appropriate. Every project should have an accidental narcotic exposure response protocol in place and staff should be well trained in its execution.

There can be a great deal of variation in the drug dose required to immobilise a bison, depending on an animal's sex, weight and temperament, individual drug sensitivity, excitability, current

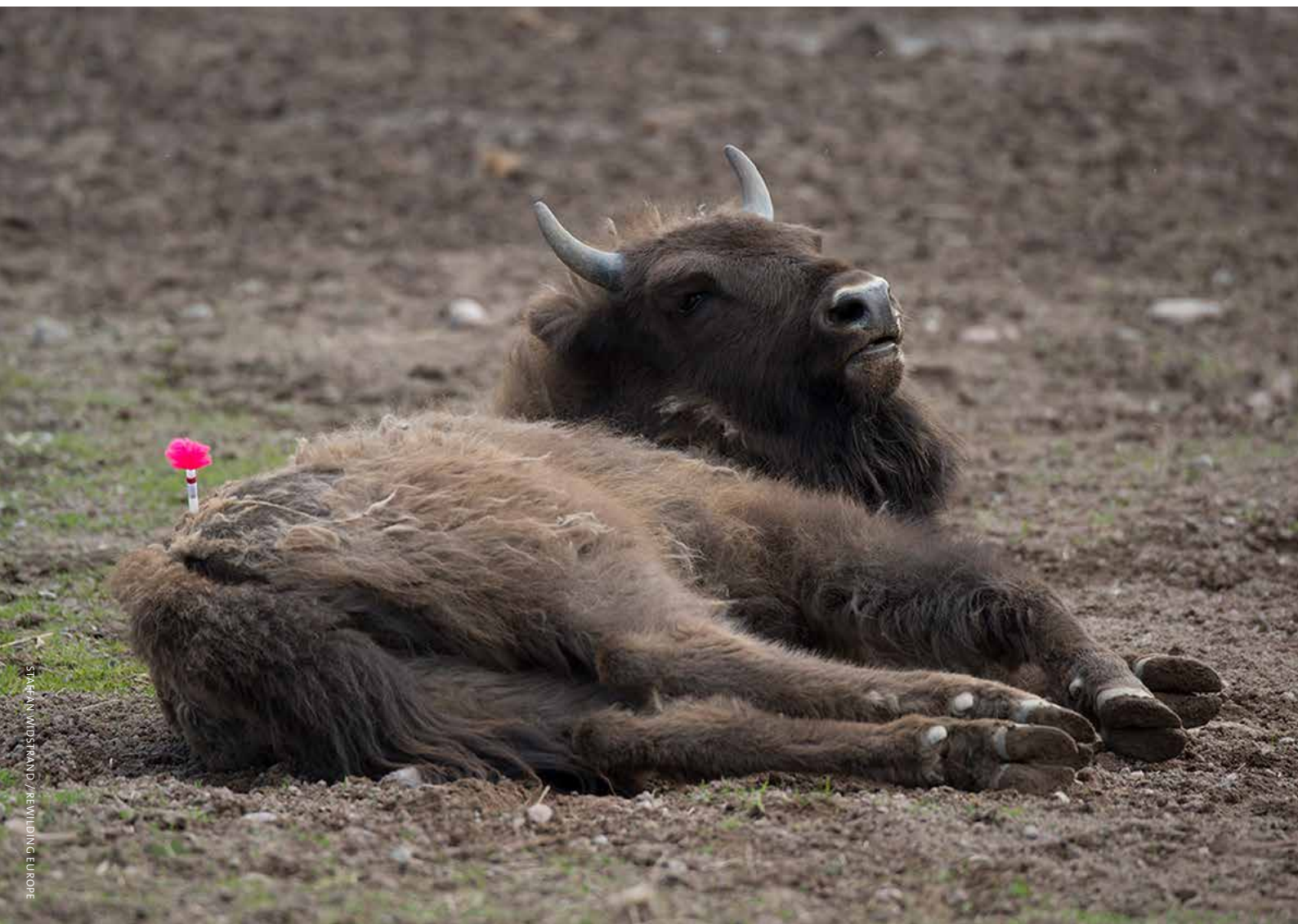
condition and whether or not they are captive or free ranging. Required drug doses are also affected by the space available for the animal to move about after drug injection, and the amount of animal stimulation that occurs prior to or after drug injection. As precise drug doses cannot always be predicted, experience of the veterinarian and a low-stress environment are important factors in immobilisation events.

Rewilding Europe will make use of the handling area where bison can be closely observed, tranquilised in a safe surrounding and treated in an area that is easily accessible. Tranquilisation outside the handling area should be avoided to avoid the risk that the animal flees and cannot be found immediately and/or injures itself. The handling area must be flat, not slippery and with no obstacles and the surface must be solid so that access is possible all year round, regardless of weather conditions. It is advisable to construct a handling area in which it is possible to separate the animals if needed, as the tranquilised animal may be vulnerable to attacks from other members of the herd.

A team, including a veterinarian, a veterinary technician and approximately six support staff, should ideally be present to assist with the

immobilisation and to move the animal once it is down, if needed. Although the veterinarian has primary responsibility for the immobilisation, safe positioning of the animal, monitoring of the animal's vital signs (respiratory rate, heart rate, temperature, percentage oxygenation of the blood etc.) and duration and dosage of the anaesthesia, he/she requires the cooperation of all team members. Safe immobilisation also depends on constant communication of important information. As with all large bovids (ruminants), the risks of regurgitation and inhalation pneumonia are high during immobilisations. A bison must never be 'turned around' as its stomach contents can become caught in the lungs and cause serious, often fatal, infections. Bison should not be immobilised when ambient temperatures are above 25°C due to the risk of hyperthermia and muscle myopathy. Tranquilisation during extreme cold conditions should be avoided but if needed preventive measures against hypothermia should be taken.

After the individual becomes recumbent, it can be safely managed in either a lateral or upright (sternal) position; right lateral recumbency is generally preferable. Eyes could be covered by fabric cloth to ease the sleeping modus as well as



protect the eyes from dust etc. During the whole immobilisation process, loud noises should be avoided as much as possible. The muzzle should always be directed towards the ground to allow any ingesta to flow out of the mouth and avoid choking. Individual pads may be placed around the metatarsal areas on each rear leg. Separate ropes can then be tied around each rear leg over the pads and secured to a solid object behind the animal (e.g. a pole or tree). The front legs can be tied together and similarly secured in front of the animal. If there is nothing to secure them to, the rear legs can be tied together to reduce the likelihood of injury due to kicking.

The duration of anaesthesia for bison should be no more than 60 minutes due to the risk of pressure necrosis. Animals should be observed closely for evidence of bloat throughout all procedures.

Once all necessary procedures have been completed, any restraining ropes should be removed from the animal's legs and non-essential personnel should leave the area. The immobilising drug is then reversed with naltrexone or other antagonist as appropriate. An animal should be left on its own while awakening.

Animals should be monitored for up to 48 hours post-immobilisation for signs of reanarcotisation. This occurs when the immobilising drug is still present in an animal's system while the reversal drug is being cleared to a level where it is no longer effective. An animal may exhibit signs similar to those of narcotic induction, including sedation, pacing, vocalizing, ataxia, head-pressing or even sternal recumbency.

If the animal is being transported a long working (up to 10 days) sedative should be administered to reduce stress levels. The animals should be fully recovered and standing before the transport ation can start.

It is best to construct the bison infrastructure at the handling zone in such a way that animals can be loaded into a trailer without tranquilisation. This can be achieved by constructing divisions and a hallway in which the animals can be gradually 'forced' forward on to the trailer. The construction must be safe (for handlers and bison), well constructed.

If the bison need to be bison tranquilised a special transportation 'blanket' or pulka can be used.

Use of forklifts and other mechanical equipment should be kept to a minimum and be used with great care to avoid risks of wounding the animal.

Use of pulka to transport and load bison in Sweden



VETERINARY CARE

3.3

Extra veterinary care might be needed during the acclimatisation period to help the survival rate of the bison and to ensure they are fit and healthy prior to release into the wild.

Broadly speaking, the baseline knowledge of medical and husbandry information for domestic cattle applies to bison. This includes non-infectious as well as infectious domestic and wild animal diseases. Bison are known or are assumed to be susceptible to all domestic bovid diseases. These susceptibilities include:

Black leg	Malignant catarrhal fever
Necrobacilliosis	Infectious bovine rhinotracheitis
Rinderpest	Actinomycosis
Paratuberculosis	Pasteurellosis
Leptospirosis	Parainfluenza
Rift valley fever	Salmonellosis
Tuberculosis	Blue tongue
Anaplasmosis	Bovine viral diarrhoea
Foot and mouth disease	Listeriosis
Brucellosis	Anthrax
Vibriosis	Enterotoxemia
Vesicular stomatitis	Contagious bovine pleuropneumonia
Haemophilus somnus	
Actinobadllosis	

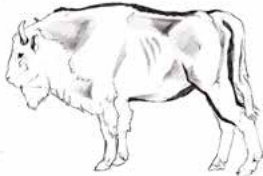
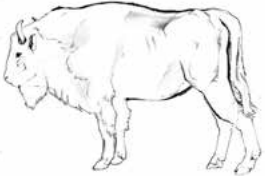
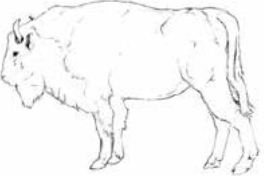
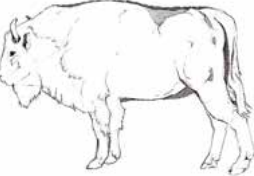
From a regulatory perspective, tuberculosis and brucellosis are of primary importance. EU member states generally require tuberculosis and brucellosis tests prior to entry, with most accepting

standard tail-fold tests and serology. The required tests needs always to be checked with the veterinary authorities prior to transport. Time for blood-testing needs to be calculated in the planning. If the animals have had the required test and tested negatively an export paper, the so-called Traces document will be provided for travel within the EU.

The animals selected for the re-introduction in the rewilding projects will be intensively screened for all bovine diseases prior to transport, regardless of origin. If the test is positive they will be excluded from the re-introduction. This will keep the risk of a disease outbreak coming from the bison and also ensures that diseases are not spread to domestic livestock. However, there is still a risk that bison will be infected with diseases from domestic cattle, as has previously been observed (Flint *et al.* 2002). Local domestic stock should therefore also be screened prior to bison release (ideally as part of the feasibility study) to assess the risk of disease transfer to bison and to take appropriate measures if necessary. Any vaccinations of bison required will only be done in consultation with the veterinary officer.

Bison are susceptible to both internal and external parasites. Commercially available cattle wormers (injectable, oral, and topical) work well in this species. However, at times when supplementary feeding has to be provided, clean feeding areas should prevent a heavy parasite load and regular faecal analysis can determine if

Condition scoring of bison

SCORE	1. Emaciated	2. Thin	3. Good	4. Fat
OUTLINE DEPICTIONS				
NECK & SHOULDERS	<ul style="list-style-type: none"> Emaciated Bone structure is easily visible No fat 	<ul style="list-style-type: none"> Neck is thin Decreased girth 	<ul style="list-style-type: none"> Neck is thick Shoulders are flat 	<ul style="list-style-type: none"> Neck is thick Fat deposits evident Shoulders slightly rounded
WITHERS	<ul style="list-style-type: none"> Emaciated Bone structure is easily visible No fat 	<ul style="list-style-type: none"> Thin Bone structure is evident 	<ul style="list-style-type: none"> Withers have fat deposits Decreasing visibility of bone structure 	<ul style="list-style-type: none"> Fat deposits are evident
LOIN & BACK	<ul style="list-style-type: none"> Emaciated Spinous processes are easily individually identifiable 	<ul style="list-style-type: none"> Spinous processes are not individually identifiable, but spine is still prominent Transverse processes faintly discernable 	<ul style="list-style-type: none"> Back is sloped to withers 	<ul style="list-style-type: none"> Fat deposits are present Back appears flatter
TAILHEAD & HIPS	<ul style="list-style-type: none"> Pelvic bones are very prominent 	<ul style="list-style-type: none"> Pelvic bones at the point of the hip are rounded, but still evident Pelvic bones at rump may be slightly discernable 	<ul style="list-style-type: none"> Fat is present around tailhead Pelvic bones appear flat 	<ul style="list-style-type: none"> Hips are rounded
RIBS	<ul style="list-style-type: none"> Emaciated Rib spacing appears wide and depressed 	<ul style="list-style-type: none"> Ribs still discernable 	<ul style="list-style-type: none"> Ribs are not visible 	<ul style="list-style-type: none"> Ribs are not visible Fat deposits may be evident

de-worming is appropriate. As wormers can have negative impacts on the environment, particularly invertebrate diversity, they should only be used if needed and only in the pre-release phase. The handling area should have an easy to clean substrate, preferably sand, that allows bison to wallow which helps the bison to battle (skin) parasites. Faeces from the handling area and around the hay feeders should be removed on a daily basis. It is particularly important to remove faecal material from feeding areas in order to break the faecal-oral contamination cycle common to most endoparasites. This is also why a mobile hay feeder, in which the hay is elevated, is preferred to hay on the ground.

Experienced veterinarians need to be linked to reintroduction projects early on and, if needed, receive special training for European bison and their tranquilisation. Bison rangers, who will preferably have experience with cattle, will monitor the condition status of each individual, initially on a daily and then a weekly basis and will consult veterinarians when required. Rewilding Europe also proposes a weekly health check by

the veterinarian whilst bison are in the acclimatisation zone. Following consultation and agreement between the local and central Rewilding Europe teams and the veterinarian that all individuals are healthy, bison will be released in the semi-wild reserve. Two week assessments by the veterinarian are then proposed in addition to daily checks by the bison ranger. The veterinarian will submit a written report to the local team following each check and the local team will report the health status of all bison on a monthly basis directly to the wildlife advisor and the conservation manager of Rewilding Europe. It is advisable to link up with a veterinary faculty of a university for the health monitoring.

Where an animal dies of unknown causes in a pre-release area, a thorough necropsy (post-mortem protocol) must be undertaken both to provide information on the cause of death for that individual, and also to report on other concurrent medical problems that could affect the herd. A review of necropsy records can uncover trends in mortality and morbidity that may prompt management changes.



Rewilding Europe aims to prepare the European bison for an independent life in the wild as much as possible. In the pre-release phase of the re-introduction additional food will be provided in the acclimatisation zone as a transition from the previous diet to a natural diet. In general the animals will not be additionally fed in the re-wilding zone and once released into the wild. During extreme winter conditions (snow) or extreme summer conditions (drought) additional feeding might be necessary if not enough natural food is available and the animal's health are at risk. After release into the wild, supplemental feeding can be used to enable animal counts to be made, individuals to be checked and as a management tool against poaching and crop damage. However, additional feeding of bison in the wild should be avoided as much as possible.

In the acclimatisation zone bison will be given food that resembles the diet at their place of origin, or as close to this as possible if this differs within the founder group. In nature, bison are intermediate grazer-browsers and their digestive system relies on a continuous intake of food material. The bison should therefore be able to feed 24 hours a day. A diet of good hay/dry silage, supplemented with commercial herbivore concentrate pellets will provide adequate nutrition. A high fibre, low protein pellet should be selected, in consultation with the veterinarian, but only provided in necessary quantities. Mineral imbalances should be avoided and should be monitored by the veterinarian. Trace mineral and salt blocks should always be available. The trace minerals should be put together based on the local circumstances in consultation with a local veterinarian. Overfeeding and obesity may significantly reduce reproductive ability. Fruits with significant sugar content, such as apples, can be provided to lure the animals e.g. in the handling area, but not be a regular part of the diet as they can contribute to rumen acidosis.

Hay or hay silage can be provided by local farmers to strengthen the relationship with the local people and support the local economy.

During acclimatisation in the pre-release phase the diet of the bison should ideally mimic food intake as received in the previous bison location and during the different seasons and consist of as much natural food as possible. The largest percentage of the diet should contain hay and or

silage that should be harvested locally by local farmers. Silage should resemble hay and thus contain little water, in order to avoid diarrhea, so called hay-silage. This means that the grass should dry for at least several days before being wrapped and should be from the first cut (farmers would generally use the second cut for cattle).

Within the handling area, granulates, minerals and additional food (e.g. apples in low quantities, carrots etc. depending on the season) will be provided to enhance the diet and to habituate the animals to the handling area in case treatment needs to be provided. The diet should be composed in close consultation with the wildlife advisor of Rewilding Europe

Hay should be provided in special mobile hay feeders. To minimize parasite loads the hay feeders will be moved throughout the enclosure on a regular basis and hay will be provided in quantities sufficient for approximately three days. This also guarantees that lower ranking animals will receive sufficient food and that all food provided is eaten. Rotten food that is left out provides health risks. Browsing material in the form of branches and stems of (young) preferred trees should be provided on a daily basis, e.g. Salix species, poplar species, especially aspen (*Populus tremula*), hornbeam (*Carpinus betulus*), birch (*Betula pubescens*), ash (*Fraxinus excelsior*), lime (*Tilia cordata*), hazel (*Corylus avellana*) etc.; this will also help prevent excessive browsing in the enclosure. Bison prefer horizontal lying stems to vertical stems, as generally more young branches will be available. Bison that are supplementary fed generally debark around feeding sites out of boredom. Depending on the available natural food in the enclosure and the season; an adult bison needs up to of 40kg of additional food per day.

In general the bison will be prepared for life in the wild, and therefore it will be preferable for the animals to be released at the beginning of the vegetation season so they can adapt gradually to a life in the wild, independent from additional feeding.

Bison are also water dependent. In the captive environment, clean, drinkable water should be available 24 hours a day. The acclimatisation zone and semi-wild reserve should preferably contain a stream or water source with easy access to good quality water all year round.

4. BISON RELEASED INTO POPULATIONS LIVING IN THE WILD

During the pre-release phase the bison are monitored closely. Initially the monitoring is focused mainly on the acclimatisation to the local environment, the new social structure, the food intake and general health status. Once released into the rewilding zone additionally the bison will be monitored on its behaviour among its herd members but also towards humans. If one or more of the bison shows unwanted behaviour (e.g. no flight behaviour towards humans), has problems with adapting to the wild conditions, has a poor health status or does not fit socially in the herd then this or these bison will be excluded for release into the wild.

The decision to release the bison into the wild

based on these criteria will be taken by the local team in consultation with the wildlife advisor of Rewilding Europe.

If animals become ill during the whole pre-release phase they will be treated accordingly and maximum effort will be taken to cure the animals. Therefore the handling area is constructed.

The herd is fit to be released into the wild, if the herd has well recovered and adapted to the local conditions, has a strong herd bonding, show good natural behaviour and the animals are all in good health. Usually, the expected adaptation time will be ± 6 months. Once released into the wild, the animals will, in general, no longer be veterinary treated.

5. OTHER ACTIVITIES IMPORTANT TO BISON MANAGEMENT AND REINTRODUCTION

5.1 BISON MANAGEMENT AND MONITORING

The optimum time to release bison into the semi-wild reserve or into the wild is at the beginning of the growing season so that there is maximum food available, although some prefer to release bison in the winter (personal communication Perzanowski, 2003), as this can limit bison distribution due to snow cover. However, when using the soft release method release into the wild is best done in the late summer/early autumn as this has given the animals the whole summer to adapt and fatten up under controlled conditions and gives them enough time to adapt to the local conditions, and living without human support, before the winter sets in. With this method high management costs, to feed the animals through the winter are avoided.

Monitoring will be an essential component of bison releases from the outset, not only to check the overall health of the population, but also to ensure social bonding and cohesion of the group, particularly as individuals may have diverse origins and be unfamiliar with one other on arrival to the overall rewilding area. Bison should therefore first be monitored in the acclimatisation zone and only when they are deemed to have recovered from transport stress, adapted to their surroundings (including electric fencing),

and display good social bonding will the group be released into the semi-wild reserve.

In the semi-wild reserve area it will then be important to monitor the animals selected for release into the wild. Direct observations will be used to study the behaviour of the herds, and the final release strategy can be adapted based on this information. As direct observation is likely to be time-consuming, close co-operative working will be achieved with universities offering students the opportunity to work closely with bison. Involving many people with monitoring and research not only offers the opportunity to closely monitor the bison but also involves many others in bison conservation. Several individuals within the first release groups will be equipped with transmitters or transponders for satellite and/or radio-telemetry. This will help keep track of the bison and will help collect information on how the bison adapt to their new environment.

Poaching and illegal hunting may also be an issue in wild areas and therefore monitoring systems will be important for effective anti-poaching management. As such, recruiting bison rangers from among local people is preferred. The ability to locate individual bison can also aid wildlife tourism.

BISON GRAZING PROJECTS

There may be rewilding areas that meet the criteria for suitable habitat but not for the appropriate socio-economic environment. This might be due to national legislation not (yet) supporting the re-introduction, a lack of support or even strong opposition from the local community, insufficient anti-poaching control, risk of agricultural damage without an adequate prevention/compensation system in place etc. Releasing bison into the wild must then be postponed to a time when these issues are resolved. Under these circumstances keeping bison in large fenced (semi-wild) areas could be an alternative. It can help increase overall population numbers that can be put in the wildlife bank. Importantly local people will also have the opportunity to familiarise themselves with bison. Bison presence

can also be beneficial to the biodiversity of the grazed area, which at the same time could attract tourists and thus generate income for the local community. These bison would then be accustomed to living in semi-wild conditions and would therefore be very suitable for establishing founder groups for other re-introductions.

Nevertheless, the rewilding area around this semi-wild bison reserve/grazing area should have sufficient suitable habitat for a viable population of bison in the future and this strategy is only advised within the Rewilding Europe context if it can function as a stepping-stone to a future re-introduction and if Rewilding Europe is working with governments and communities to eliminate obstacles to rewilding, as recommended and guided by the rewilding plan.

5.2

TRAINING

In most re-introduction areas people are no longer familiar with bison. As it is best to recruit people from the local community for the management of the bison to create 'ownership' over the bison it is needed to train these people, (preferably farmers with experience with cattle or people experienced with wildlife), how to manage bison but also to train them on bison behaviour and ecology. These training sessions should take place on location offering the bison rangers to gain first hand experience with bison.

The same holds for the veterinarian(s) linked to the project who will receive first-hand experience, if

needed, on bison. Specifically training on tranquilization and handling is of great importance.

As these so called bison rangers may also have a guiding task, in this case they will be trained together with other people from the local community interested in tourism about visitor hospitality, and interpretative guiding. This is particularly important, as most of these people have no experience with working with tourist and need to have an understanding of tourist expectations, values and hospitality

All training session should take place before arrival of the first bison.

5.3

ATTACHMENT: EUROPEAN BISON BODY CONDITION INDEX

EXPLANATION

In the wild, animals such as European bison build up their body fat reserves during the growing season. These reserves are accessed in winter. The Body Condition Index (see below) is a tool used to determine its condition, and the index determines the amount of fat and muscle coverage on the animal. Each animal's score tells us something about its well-being, and is determined by its behaviour. The following behaviours are taken into account: foraging, social, alertness and coat condition. Both the body condition index and the animal's score are determined on a scale from 1 to 5, where 1 refers to skinny and 5 to fat. The score of an animal is always the same, regardless of age or time of year. For example, a score of 2 in April looks the same as a score of 2 in November. The aim is to score as many animals in the herd as possible. The whole herd receives a number by averaging the total of the individuals' results, and the individual animals also each receive a separate number.

Body condition index:

- 1 Poor, emaciated, severe undercondition
- 2 Moderate, skeleton obvious
- 3 Good, frame and covering well balanced
- 4 Excellent, frame not as visible as covering
- 5 Too fat, severe overcondition

In general it can be said that animals have the highest body condition in the fall and the lowest at the end of winter/beginning of spring. This decrease in condition is gradual. A score of 1 or 2 does not say everything in itself. What time of year

is it? How is the behavior of the animal, ie what is the animal score? It may well be that an animal scores a 1 or 2 for its body condition, but the animal score is 4 or 5.

Factors that play a role in determining the body condition are:

- **Age:** Older animals are generally in a lesser condition than animals in the prime of their life. Often older animals are tougher: despite their poorer body condition they can have a high animal score
- **Gender:** Males are often in a better condition than females. For females in general it can be said that those who are not lactating or pregnant have a better body condition than the animals who are, for they don't have to invest in their offspring.

Example 1: a cow scores body condition 1–2 but keeps joining the herd, the coat still shines and she continues to actively seek food and responds alertly to her environment (animal score of 5). This body condition score does not mean there is an immediate reason to intervene. It can be a tougher or older animal that survives in spite of everything.

Example 2: a cow scores body condition 1–2 but has separated from the herd, has no vital physical appearance and has an apathetic response (animal score 1). Intervention is required because of the duty of care. The cow must not suffer or die from hunger or a complication caused by decreased resistance which can be indirectly caused by malnutrition.

Rating body condition:

(Source basic table: management report OVP 2011–2015, adjusted for European bison)

1 POOR, EMACIATED, SEVERE UNDERCONDITION	Back bone like teeth of a saw (attention: this is often not visible due to coat covering) <ul style="list-style-type: none">• coverage between hip bone and pin bone severely sunken, no muscle coverage• pin bone very prominent and angular, with deep V-shaped cavity under the tail
2 MODERATE, FRAME OBVIOUS	Back bone clearly visible <ul style="list-style-type: none">• coverage between hip bone and pin bone clearly sunken, little muscle coverage• pin bone very prominent and angular, with deep cavity under the tail
3 GOOD, FRAME AND COVERING WELL BALANCED	Frame and covering well balanced <ul style="list-style-type: none">• coverage between hip bone and pin bone slightly sunken, slight muscle coverage• pin bone rounded, shallow cavity under the tail
4 EXCELLENT, FRAME NOT AS VISIBLE AS COVERING	Frame not as visible as covering <ul style="list-style-type: none">• coverage between hip bone and pin bone light to good• pin bone rounded, no shallow cavity under the tail
5 TOO FAT, SEVERE OVERCONDITION	Covering prevails, too fat <ul style="list-style-type: none">• coverage between hip bone and pin bone good• pin bone embedded in fat, cavity filled with fat

Rating animal score:

(Source basic table: management report OVP 2011–2015, adjusted for European bison)

1	<ul style="list-style-type: none">• movement behavior: very slow irregular movements, often stumbling, not fixed on the legs, difficulty getting up• exploring behavior: disoriented, apathetic• social behavior: separated*• foraging behavior: none
2	<ul style="list-style-type: none">• movement behavior: slow, stiff, less fixed on legs• exploring behavior: disoriented, not alert, passive• social behavior: follows the herd delayed
3	<ul style="list-style-type: none">• movement behavior: less powerful movements, stiff• exploring behavior: slightly passive• social behavior: less interactive, close to the herd, taking care of itself• foraging behavior: searching for food, feeding and ruminating
4	<ul style="list-style-type: none">• movement behavior: powerful movements• exploring behavior: active• social behavior: moderate interactive, close to or in the herd, care of itself• foraging behavior: searching for food, feeding and ruminating
5	<ul style="list-style-type: none">• movement behavior: good, coordinated, powerful• exploring behavior: alert, responsive to the presence of people or other animals• social behavior: interactive, in the herd, care of itself• foraging behavior: matching the environment, feeding and ruminating

* separation can also occur when a cow is giving birth or when an adult bull is living solitary, this is normal social behavior

Other considerations:

- Dung: what is the state of the dung in relation to the diet (solid at a high fiber diet and thin with young regrowth), and compared with the rest of the herd

N.B.

This is a living document which is consequently incomplete and requires regular review and updating. Experience will be gained in the field by scoring the animals. If necessary, the descriptions and drawings in this document will be adjusted.

EUROPEAN BISON BODY CONDITION INDEX 1 TO 5

Measuring points:

A Space between hip bone – pin bone

At score 1 a clear depression visible, at score 5 all space covered

B Depression between hip bone – ribs

At score 1 depression clearly visible, at score 5 hardly visible

C Muscle hind leg

Muscle is always visible, but at score 1 clearly concave and 5 filled

D Covering back bone

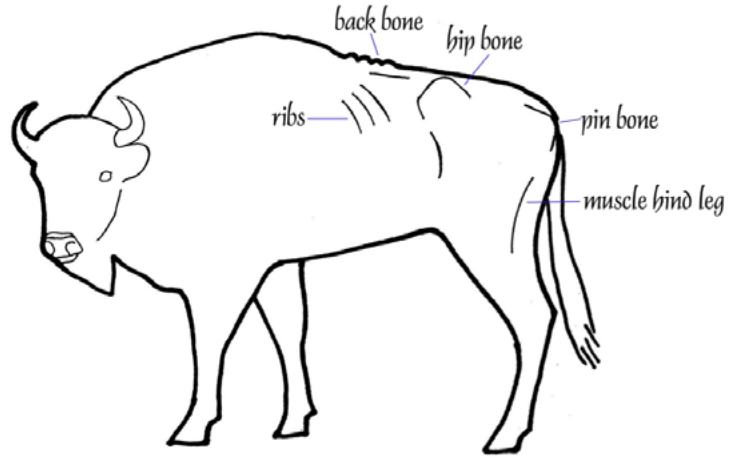
At score 1 back bone very sharp, at score 5 covered in fat. Measuring point at pelvis

E Cavity under tail

At score 1 cavity clearly visible, at 5 not visible

N.B.

With reproducing cows the cavity is more prominent than with bulls.



SCORE	1	2	3	4	5
A/C VISIBILITY HIP BONE – PIN BONE AND MUSCLE HIND LEG					
B DEPRESSION BETWEEN HIP BONE – RIBS					
D COVERING BACK BONE					
E CAVITY UNDER TAIL BACKVIEW					

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