

BLACKBUCK Conservation Action Plan for Nepal 2023-2027



Government of Nepal Ministry of Forests and Environment DEPARTMENT OF NATIONAL PARKS AND WILDLIFE CONSERVATION





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Published by:

Department of National Parks and Wildlife Conservation, Kathmandu, Nepal.

Citation:

DNPWC. 2023. Blackbuck Conservation Action Plan for Nepal (2023-2027). Department of National Parks and Wildlife Conservation, Kathmandu, Nepal.

In technical and financial support from WWF Nepal

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Government of Nepal Ministry of Forest and Environment Department of National Parks & Wildlife Conservation



Foreword

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abarmahal, Kathmandu Blackbuck ("Krishnasar" in Nepali) is one of the endangered mammals with its founder population in Krishnasaar Conservation Area. Blackbuck is listed at the protected mammals list under the NPWC Act, 2029 (1973). Nepal Biodiversity Strategy and Action Plan (NBSAP, 2014-2020) has also emphasized the priority actions for conserving endangered species including Blackbucks. In 2012, Government of Nepal made a maiden effort to establish satellite population of the species in Shuklaphanta National Park which is also its former ranging habitat. In the past, Government of Nepal have rolled out conservation initiatives for management of reintroduced blackbuck through Site Specific Conservation Action Plan for Blackbuck in Shuklaphanta Wildlife Reserve (2016-2020).

Blackbuck conservation is facing multitude of threats including climate induced disasters such as high floods and prolonged drought tend to adversely affect the entire wild populations due to their confinement within limited areas of old floodplains. Blackbucks are likely impacted by outbreak of epidemic diseases. Comprehensive conservation action plan to provide guidance and address the issues looming over the species survival and its habitat integrity were lacking. Blackbuck Conservation Action Plan Nepal (2023-2027) focuses to maintain a genetically viable wild populations of Blackbuck and secure population against emerging threats such as anthropogenic pressures and the potential impact of climate change. This action plan will continue to provide crucial guidance to implement priority conservation initiatives which will benefit species, habitats, and communities.

I sincerely thank the technical team of the Department of National Parks and Wildlife Conservation for preparing this Action plan and WWF's USAID Hariyo Ban Program for providing financial and technical support. Besides, I acknowledge the contribution of wildlife conservation partners and expect its continuous support and commitment to the successful implementation of this plan.

I am confident that this action plan will contribute to the long-term existence of the Blackbuck and

its habitats in Nepal.

Sindhu Prasad Dhungana, PhD **Director General**

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ACRONYMS AND ABBREVIATIONS

BaNP	Banke National Park
BNP	Bardia National Park
CA	Conservation Area
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DNPWC	Department of National Parks and Wildlife Conservation
GIS	Geographic Information System
I/NGO	International/ Non Governmental Organization
IUCN	International Union for Conservation of Nature
KrCA	Krishnasaar Conservation Area
NPR	Nepali Rupee
NTNC	National Trust for Nature Conservation
ShNP	Shuklaphanta National Park
WWF	World Wildlife Fund
ZSL	Zoological Society of London



Blackbuck (Antelope cervicapra) isn't only a protected wildlife of Nepal but it is also listed in Appendix III of CITES. Locally known as "Krishnasaar" in Nepal, it is believed that Lord Krishna cared for this wildlife. Blackbuck was once common throughout the Indian sub-continent. Historically, blackbuck was distributed across the whole Indian subcontinent, south of the Himalayas including Nepal, India, Bangladesh, and Pakistan. In Nepal, blackbuck was once commonly found in western Terai regions of Kanchanpur, Bardia, and Banke districts but later the population declined and the species was restricted to a small patch of scrub land in Khairapur, presently Krishnasaar Conservation Area (KrCA) at Khairapur, Bardia. A second population of blackbuck has been established in Hirapur phanta of Shuklaphanta National Park, Kanchanpur. The blackbuck also exist in the animal facilities in Central Zoo and Pashupati Development area in Kathmandu. The risk of extinction to the species, both in captivity and in the wild is still high. To begin with, the KrCA itself is a small area and even a large chunk of this area has been occupied by human settlement and agricultural land. In case of Shuklaphanta, the species is confined within a large enclosure of 58 ha. and space requirement will keep on increasing with the rapid increase in population.

Climate induced disasters such as high floods and prolonged drought tend to adversely affect the entire wild populations of blackbuck due to their confinement within limited areas of old floodplains. Furthermore, blackbucks are likely to be impacted by outbreak of epidemic diseases. In this background, it is imperative to develop a comprehensive conservation action plan to prescribe effective measures to conserve and manage blackbuck populations and their habitats.

The goal of this action plan is to maintain a genetically viable wild populations of blackbuck and secure population from anthropogenic pressures and the potential adverse impacts of climate change. The plan identifies five objectives - enhance scientific knowledge on species ecology and habitat; manage habitat for enriching blackbuck populations; harmonize and strengthen local stewardship for blackbuck conservation; develop research and monitoring guidelines for rewilding; and establish a sustainable financing mechanism towards achieving this goal.

This plan further highlights threats, challenges, and opportunities to implement the identified actions under each objective. The Department of National Parks and Wildlife Conservation has the responsibility of implementing this action plan in collaboration with the Department of Forests and Soil Conservation, provincial and local governments, multiple conservation partners, and local communities. The total estimated budget for the implementation of this 5-year action plan is NPR 1,74,33,500 (US\$ 1.5 million dollars¹).

¹Exchange Rate: 1 US\$= NPR 115

Chapter I INTRODUCTION

1.1 RELEVANCE OF THE ACTION PLAN

At the global scale, almost all ecosystems are declining and becoming increasingly fragmented (Saunders et al. 1991; Fischer and Lindenmayer 2007; Laurance et al. 2011). Consequently, small patches now represent an increasingly large component of the remaining habitat in many ecosystems. The blackbuck Antelope cervicapra (Linneaus 1758), once abundant across the Indian subcontinent, is already extinct from Bangladesh and Pakistan. The species is now confined to only Nepal and India. Blackbuck is listed as 'Least Concerned' in IUCN Red List of Threatened Species, as the population in India is remarkably increasing in recent times (IUCN SSC Antelope Specialist Group. 2017), but the species has been listed as 'Critically Endangered' in The Status of Nepal's Mammals: The National Red List Series (Jnawali et al. 2011) indicating small and isolated population under the high anthropogenic and climatic threats. Legally blackbuck is protected in Nepal by CITES (by listing it in Appendix I) and National Park and Wildlife Conservation Act, 2029 (by listing it as a protected species).

Blackbuck was thought to be extinct until a small population of 9 individuals were discovered at Khairapur in 1975. In 2009, an area of 16.95 km² was declared as Krishnasaar Conservation Area (KrCA). Thereafter, the population gradually reached more than 230 individuals. To avoid the risk of climatic and non-climate disasters, the Department of National Parks and Wildlife Conservation (DNPWC) reintroduced blackbuck (n=28) to its former range in Shuklaphanta National Park (ShNP). Kanchanpur. The reintroduced population thereof has now increased to 165 plus individuals. Although the numbers of blackbuck in both areas are increasing, several threats and local issues persist posing threats to these populations.



Fragmented, small, and isolated populations are at greater risk from demographic (reproductivity and mortality) and environment stochasticity (Purvis et al. 2000). Low genetic diversity has been observed in the different organisms that are in fragmented habitats and isolated distributions (Bouzat et al. 1998; Honnay et al. 2007; Dixo et al. 2009). Species with small populations, such as the blackbuck may also suffer from genetic problems (loss of heterozygosity and inbreeding depression) (Jnawali et al. 2011). Due to isolation, the loss of genetic variability and adaptive potential could occur within blackbuck populations, making it a priority to preserve genetic diversity and connectivity for the future. Additionally, if loss of an adaptive potential occurs, it could be detrimental, especially for populations found in areas that commonly experience disturbance (Brzyski and Culley 2011).

A loss of diversity can reduce the fitness of populations by limiting their potential to react to habitat changes and thus potentially elevating extinction risk. Habitat loss, fragmentation, degradation, and human-blackbuck conflict are the key threats to the species. Climate-induced disasters such as floods and prolonged drought are also perceived as major threats. The high flood in Babai river nearly exterminated the source population in Khairapur in 2014, when 40 out of 300 individuals drowned. Current research, knowledge, and conservation efforts are insufficient to ensure the conservation of habitat and long-term survival of this nationally threatened species. The 'Site-specific Blackbuck Conservation Action Plan (2016-2020)' was prepared and implemented in Hirapur Phanta (previously cultivated revegetated grassland) of ShNP, however blackbuck-specific conservation action plan at the national level has not yet been developed. Persistent threats and challenges indicate the need for a national plan and coordination among all the stakeholders. This conservation action plan also aims at addressing the current knowledge and conservation gap through collaborative, coordinated, and participatory conservation intervention at local and national levels.



1.2 CONSERVATION ACTION PLAN DEVELOPMENT PROCESS

The action plan preparation team collected and reviewed available secondary information about different aspects of blackbuck conservation. The team also reviewed policies, strategies, reports, management plans, and other relevant publications (see reference section) at the national as well as global levels. Consultation meetings with park officials, researchers, community members, provincial government authorities, and local governments were conducted in the field. The consultative meetings were organized in the Division Forest Office of Banke and Bardia district, Chitwan National Park (CNP), ShNP, Bardia National Park (BNP), Banke National Park (BaNP), and KrCA. Also, field observations were conducted in KrCA, Hirapur Phanta in ShNP,

Baghaura Phanta in BNP, and proposed potential site in Tikauli, Ratna Nagar Municipality, Chitwan. The consultations with concern officials in the Ministry of Forests and Environment (MoFE), Singhdurbar; Ministry of Industry, Tourism, Forest and Environment (MoITFE) of Bagmati, Lumbini and Sudurpaschim Provinces; Department of Forests and Soil Conservation (DoFSC); DNPWC; NTNC; World Wildlife Fund (WWF) Nepal; Zoological Society of London (ZSL) Nepal and Tribhuvan University were carried out to glean information required for preparing this plan.



1.3 SCOPE OF THE CONSERVATION ACTION PLAN

Once considered to be extinct from Nepal in the early 70s, nine individuals of blackbucks were observed in Khairapur, Bardiya in 1976. Now, the last surviving wild population is restricted to KrCA, Bardiya, and a small re-introduced population survives at Hirapur Phanta in ShNP. The Central Zoo, and Pashupati Development Area holds a few individuals Moreover, a small animal facility in Nepalgunj sub-metropolitan city had a few blackbucks prior to their relocation in Hirapur Phanta. The risk of extinction to the small and isolated species, both in captivity and in the wild is still very high. Small, and isolated population loses their genetic heterogeneity and is more vulnerable to extinction (Franklin 1980). Harmonizing species ecology information with management intervention through advanced tools and techniques is crucial for species conservation. As the population in both KrCA and ShNP is increasing, the enclosed habitat area in each site is becoming smaller. The fenced core area allocated for species is 2.46 and 0.58 in KrCA and Hirapur, respectively (Bist et al. 2021). In the natural habitat, individual male blackbuck requires at least 2 ha to maintain its territory (Jhala 1991). It is likely that a fierce intraspecific competition takes place among males for females.

Furthermore, small, and isolated populations of blackbuck are prone to both climatic and nonclimatic threats. It is very important to record regular database on demographic and population characteristics, behavior characteristics, genetic status, and disease. Also, catastrophic events such as high floods, prolonged drought, and fire can wipe out the entire population, as the existing populations are confined in relatively small areas. In this background, it is essential to develop blackbuck specific conservation action plan and its implementation targeting to both the populations and their habitats. The conservation action plan recommends measures for the long-term survival of the blackbuck and its implementation will contribute to the restoration of its existing and historic habitats where the species has been reintroduced. As guided by the National **Biodiversity Strategy and Action Plan (NBSAP)** 2014-2020, a Site-Specific Conservation Action Plan for Blackbuck in ShNP (2016-2020) was endorsed by DNPWC to manage re-introduced population of blackbuck in ShNP. Moreover, KrCA Management Plan (2074/75-2078/79) was developed and implemented by DNPWC. Both periodic action plans need to be reviewed and updated to address current management issues of and potential threats to the species. Since the management issues in both areas are by and large similar, this action plan intends to address the problems, issues and challenges pertaining to the populations therein. The information used in this conservation action plan are derived from available literatures, recent study reports, field surveys, legislative provisions and interactions with the field staff having long experience in blackbuck conservation.

2.1 GLOBAL DISTRIBUTION

The blackbuck *Antelope cervicapra* (Linneaus 1758) is one of the bovines under the genus 'Antelope' which is endemic to Indian subcontinent. Historically, blackbuck was distributed across the whole Indian subcontinent ranging from the west Pakistan along the foothills of the Himalayas from Punjab (Pakistan) through Uttar Pradesh (India) and Nepal to West Bengal (India) (IUCN SSC Antelope Specialist Group, 2017). Their range in the region decreased during the 20th century due to widespread hunting, habitat loss and the wild populations from Bangladesh and Pakistan got extinct during 1970s (Bashistha et al. 2012). Outside the native range, blackbuck was introduced in different countries including United States, Australia, and Argentina.

2.2 NATIONAL DISTRIBUTION

In Nepal, blackbucks were once commonly found in eastern and western Terai regions of Kanchanpur, Bardia, and Banke districts as late as the 1960s (Pradhan et al. 1999) but later the distribution was confined only in Khairapur area, currently the KrCA in Bardia. To avoid the potential risks from anthropogenic activities as well as climatic and non-climatic disasters, blackbucks in Nepal were reintroduced to Hirapur Phanta of ShNP, Kanchanpur, one of its former ranges, (DNPWC 2012) from Khairapur and animal facilities in Central Zoo and Nepalgunj.



Figure 1. Distribution of blackbuck in Nepal (Source: DNPWC 2016, KrCA 2017)



2.3 ECOLOGY

TAXONOMIC POSITION

Based on morphology particularly coat, color, length, and shape of the horn, the species has four sub-species - *A. cervicapra cervicapra* (South India), *A. cervicapra centralis* (Central India), *A. cervicapra rupicapra* (North India and Nepal) and *A. cervicapra rajputane* (North-West India and Pakistan).

MORPHOLOGY

The blackbuck is a medium-sized antelope that stands about 80 cm at the shoulder and weighs about 40 kg. They are sexually dimorphic. Males have 12 whorled horns up to 79 cm which are absent in females. The color of male progressively turns into darkish with age, tawny to intense brown or black. Female and young ones are yellow at their front and rear. Chin and undersides of legs and chest are white in both sexes. Eyes encircled by a white ring. The body length of species ranged from 100-150 cm with the tail length 10-17 cm and body weight for the male ranged between 20- 57 kg and of female 19-33 kg (Roberts 1997; Sheikh and Molur 2004).

POPULATION

It has been speculated that the global population may have numbered 4 million a couple of centuries ago; around 80,000 individuals in 1947 (Rahmani 2001) and about 50,000 in early 2020s. The recent population scenario of blackbuck in KrCA shows a fluctuating trend - 9 in 1975, 164 in 1988, 92 in 1993, 40 in 2000, 264 in 2011 (DNPWC 2012) and 200 in 2021 (DNPWC 2021). In ShNP, the population has reached to 185 individuals indicating a gradual increase in the population (Table 1 and Figure 2).

Table 1: P	Table 1: Population status of blackbuck in KrCA and ShNP							
Year	KrCA	Year	KrCA	Year	KrCA	ShNP		
1975	9	1991	177	2007	185			
1976	23	1992	150	2008	191			
1977	38	1993	92	2009	219			
1978		1994	111	2010	225			
1979		1995	109	2011	264			
1980	23	1996	101	2012	287			
1981	38	1997	113	2013	300	31		
1982		1998	113	2014	287	36		
1983	66	1999	50	2015	230	35		
1984	100	2000	40	2016	257	44		
1985	130	2001	56	2017	208	59		
1986	152	2002	74	2018	222	66		
1987	164	2003	92	2019	234	88		
1988	164	2004	85	2020	192	115		
1989	177	2005	107	2021	200	141		
1990	177	2006	131	2022	234	185*		

*As of April 2022, in ShNP.



Figure 2: Population status of blackbuck in KrCA and ShNP

HABITAT USE AND FORAGING

The species inhabits open grassland, dry thorn scrub, scrubland, and lightly wooded habitats as well as agricultural margins, where it is often seen feeding in fields. They prefer hot temperature for foraging and marginal agricultural lands and scrublands are a good source of forage and cover for them (Jhala et al. 1992, Deal 2011). The blackbucks feed on fresh tender leaves, grass, crops, cereals, vegetables, and leaves of shrubs and trees. They forage for a long time, and select succulent grasses, tender shoots of crop, and plants that help them to maintain water balance in their bodies (Meena and Chourasia 2017). They are mainly sedentary,

BEHAVIOR

A Star Martin Star Contraction Constant

The blackbucks are mainly diurnal, but sometimes nocturnal (Long 2003). They are gregarious (Schaller 1967) and live in groups (single or mixed-sex, numbering from fifteen to several thousand animals) or sometimes solitary at densities of 0.5–3 per hectare (Long 2003). In its native range, mating can occur throughout the year. Females are sexually mature at approximately 15 months. Most adult females are likely to calve once a year but those in good body but in summer may move longer distances in search of water and forage (Rahmani 2001). In areas of severe habitat decline, blackbuck depends on cereal crops (Walker 1964, Lehmkul 1980). In Nepal, blackbuck lives along open habitat of short grassland in KrCA and Hirapur Phanta in ShNP. KrCA has open grassland while forest area is dominated by riverine forest. Simal *(Bombax ceiba)*, Khair *(Acacia catechu)*, and Sissoo *(Dalbergia sissoo)* are the dominant flora. In KrCA, a total of 107 plant species have been reported. Hirapur Phanta is enclosed by forest habitat in the western and southern sides and riverbank in the eastern side.

condition could produce at the gap of six months, one during the post-monsoon peak (September) and another during the March-April peak (Jhala and Isvaran 2016). The young can run soon after birth and are weaned at around 2 months. Lifespan can be up to 18 years in the wild (Long 2003).

Chapter III REVIEW OF BLACKBUCK CONSERVATION PLANS

3.1 SITE SPECIFIC CONSERVATION ACTION PLAN FOR REINTRODUCED BLACKBUCK POPULATION IN ShNP

To establish second viable population of blackbuck in Nepal, 17 hectares of grassland of Hirapur Phanta in ShNP was enclosed with mesh wire fences to reintroduce first batch of 28 Blackbucks in 2012. Later, Site Specific Conservation Action Plan for Blackbuck for ShNP (2016-2020) was prepared and implemented. The conservation action plan focused on addressing the issues related to enclosure size; practices adopted for blackbuck reintroduction; livestock pressure on the new habitat; risk of unprecedented climatic events such as drought and high flood; and financial sustainability. The action plan recommended different strategies to cope with different threats, vulnerability, and other management issues. Strategies, such as provision for adequate breeding and foraging space, scientific management and monitoring of habitats, effective health care and effective coordination among stakeholders and public sectors were suggested for the population to thrive in Hirapur. For the improvement of habitat quality, use of cutting-edge technology in research and monitoring and application of best available management tools were recommended. Engaging nearby buffer zone communities in conservation through alternative livelihood options was encouraged to enhance community blackbuck stewardship in conservation. Developing an appropriate mechanism to sustain the management cost and collaboration with conservation partners for resource leverage was proposed for establishing sustainable financing mechanism. As a result, different management practices were implemented in ShNP. Northeastern part of Hirapur Phanta is fenced, water holes are constructed, non-palatable plant species are removed and supplementary natural food is managed by regular ploughing of grazing field. Likewise, regular health care is ensured. The population has increased to 185 in April 2022 (ShNP 2022) indicating effective conservation approaches in ShNP. Subjective review of the objective suggests moderate to high level of result achieved in last five years.



	OBJECTIVE	TARGET ACHIEVED
Objective 1	Manage blackbuck population for long term viability in ShNP	Moderate to High
Objective 2	Manage habitat in ShNP to support a blackbuck population in the long term	Moderate to High
Objective 3	Strengthen community engagement for Blackbuck conservation	Moderate to High
Objective 4	Establish sustainable financing mechanism	Low



3.2 KRISHNASAAR CONSERVATION MANAGEMENT PLAN (2074/75-2078/79)

After a thorough study of the existing ground situation, background information and attributes, past management and current practices, DNPWC approved Krishnasaar Conservation Management Plan (2074/75-2078/79) for KrCA. Different strategies were proposed for addressing different issues. Resolving encroachment issue, constructing office building, allowing communities to use ecosystem services, intensifying regular monitoring, setting up reporting and information sharing system were prioritized in the management plan. Relocation of communities inhabiting within the KrCA, irrigation of grassland during the dry season, control of livestock grazing, control of invasive alien plant species, and harmonization

of local communities' needs and aspirations were strategic actions for habitat management. For fire management, developing a network of fire lines; increasing awareness; engaging community in management and conservation; and, managing fire-fighting toolkits were suggested. Several soil mounds were built to provide refuge during the high flood periods. Furthermore, formulation of a protocol for wildlife health monitoring and disease surveillance, and coordination with district veterinary offices was proposed for the management of blackbuck health. Among various issues, resolving encroachment issue was a big challenge.

Chapter IV MAJOR CONSERVATION EFFORTS AND ACHIEVEMENTS

The blackbuck conservation effort was initiated since 1975 with a remaining wild population of 9 individuals in Banke and Bardia districts (Dinerstein 1975, Wegge and Welson 1976). Banke population got locally extinct due to loss of habitat, and hunting (Bista 1981, Shrestha 1997, Majpuria et. al 1998). Remaining small population in Bardia was protected through a joint effort between District Forest Office and Bardia NP until KrCA was established in 2009. First attempt of establishing a second viable population was initiated in late 1970s. Between 1977 and 1992, 42 blackbucks were translocated from Central Zoo to Baghaura Phanta of BNP, but they could not survive due to dominating tall grasses and heavy predators' pressure (Pradhan et al. 2001). The Government concluded that blackbuck cannot survive in areas other than Khairapur, and decided to acquire private land at Khairapur in January, 1994. During 1994-96, the government acquired additional private land to expand its habitat. In 2007, DNPWC prepared first Blackbuck Conservation Action Plan (2007-2011) (Poudel, 2011) and declared KrCA in 2009.

Since the establishment of KrCA, the KrCA staff have been ensuring routine patrols and effective measures to control livestock pressure on habitat and predation by feral dogs. Remaining two forest patches within the core area are being managed jointly by KrCA and Community Forest User Groups. Grassland management is the most crucial task in KrCA and is being done by burning, uprooting, and removing invasive species, controlled grazing, and irrigating grassland patches during the dry seasons. Waterholes are built to provide drinking water, mainly during the dry seasons. Soil mounds are built to provide shelter during the high flood periods and have been proven very effective. Local authorities and people continue to extend their efforts to resolve various issues related to cattle grazing, physical infrastructure development within KrCA, and human-blackbuck conflicts.

In ShNP, 42 individuals were reintroduced in Hirapur Phanta to establish a new viable population. The population has now increased 185 individuals. Α Site-Specific to Conservation Action Plan for Blackbuck in ShNP (2016-2020) was endorsed by DNPWC to ensure the long-term survival of reintroduced blackbuck ShNP. in Also. KrCA is implementing Krishnasaar Conservation Area management plan (2074/075-2078/079) (KrCA 2017).



Chapter V CONSERVATION THREATS AND OPPORTUNITIES

5.1 THREATS

5.1.1 HABITAT ENCROACHMENT AND DEGRADATION

Land tenure issue within the core and fringe areas is the main conservation threat in protecting blackbuck in KrCA. Continuing encroachment of the habitat for agriculture, and illegal settlements, livestock grazing and excessive

5.1.2 CLIMATE-INDUCED HAZARDS

Most part of the KrCA is an old flood plain of Babai River; and hence the area frequently experiences high floods affecting the population, and the availability of nutritional forage plants. Forty individuals were drowned to death, and key habitat area remained inundated for several days due to high flood in 2014. Temperature increase, erratic/intense precipitation leading to flood, prolonged drought, and consequent grassland fires during dry seasons are experienced because of climate change. Climate change impacts

5.1.3 HUMAN-BLACKBUCK CONFLICT

KrCA is surrounded by several villages. People with relatively low income depend on KrCA for fuelwood, fodder, and grazing of their livestock. Blackbucks frequently raid in the croplands inside the core area (Pachaskhalla, Pataha and Turantpur villages) and occasionally sneak into those in the fringe areas outside the boundary along Bhagartaal and Nimkothia villages. Local collection of grasses in the natural habitats have also posed serious threats to the species. These activities and changes in land-use patterns have restricted blackbuck to confine within limited space.

causing changes in vegetation composition, and phenology may reduce or substitute preferred forage plants in future. The global mean temperature is projected to rise over 2° C by 2050, which is expected to severely impact the ecosystems (IPCC 2014) and animal populations and drive them to massive extinction in the future though the population may survive in a few individuals or isolated in few patches (Isaac 2009).

people, on the other hand, illegally graze their livestock, collect firewood, grass, and other forest products, and regularly use road that traverse through the core area. Human activities within the core areas and crop raiding by blackbuck have become the most serious challenges in conservation of this species.

5.1.4 PREDATION PRESSURE

The natural predators of blackbuck in KrCA are golden jackal, striped hyena, and common leopard. However, the domestic dogs also pose a major threat to the species. These dogs attack in a pack to kill fawns during the fawning seasons. Between fiscal year 2072/2073 and 2077/2078,

5.1.5 LIMITED SPACE

The habitat requirements of the blackbuck are unique. They prefer open and flat habitats with short-growing grasses. Core area occupies 246 ha. in KrCA and 58 ha. in Hirapur (Bist et al. 2021) and both the sites are very small for growing populations therein. In a natural habitat, a single blackbuck male requires at least 2 ha of land to maintain its territory (Jhala 1991).

5.1.6 PATHOGEN AND ZOONOTIC DISEASES AND RISK OF DISEASE TRANSFER

Several livestock graze in KrCA, the species is likely to suffer from the potential risk of transmission of infectious diseases. Blackbucks are susceptible to several parasitic infections including coccidiosis, paramphistomiasis, fascioliasis, schistosomiasis, and taeniasis nematodiasis (Thornton et al. 1973). The prevalence of gastro-intestinal parasites in both KrCA and ShNP was found to be 90 % (Chaudhary and Maharjan 2017).

Blackbucks mostly suffer from parasitic infections and Foot and Mouth Disease (FMD)

5.1.7 INVASIVE ALIEN PLANTS

Besides the loss of animals, flooding has also influenced changes in vegetation communities and proliferation of invasive species. After 2014 flood, Gandhe jhar *A geretum conyzoides*, one of the notorious invasive species, invaded in KrCA. Other invasive species, such as Jarakush

5.1.8 SMALL ISOLATED POPULATION

The small and isolated population facing habitat loss in KrCA triggers the species to limit their space use and lose genetic variability. A loss of genetic variability affects individual adaptation resulting in reduced litter size, increased mortality, and increased susceptibility to diseases and parasites 13 fawns were killed by a pack of dogs in KrCA. Since Hirapur population is well protected by the mesh wire fence combined with solar powered fence, blackbuck casualties by predation have not been reported yet.

The available space is far less than an individual blackbuck requires to maintain its lifecycle. The limited space in both areas is likely to lead to a fierce intraspecific competition among males for females. Expansion of the space in Hirapur Phanta isn't an issue to house a growing population of blackbuck.

in Nepal. Although the periphery of the CA is fenced, goats and cows are seen grazing in the open ground of KrCA. Similarly, ShNP has a record of approximately 500 cattle entering the park for grazing every day. The heavy grazing pressure from unvaccinated cattle both in KrCA and ShNP has put blackbucks at higher risk of disease infection from cattle to blackbucks and vice-versa. Reportedly the diseases are one of the major causes of blackbuck mortality.

Cymbopogan jwarankusa, Tapre *Cassia tora*, Kantakari *Solanum sp.*, and *Parthenium hysterophorus* are rapidly spreading across the grassland of KrCA (KrCA 2017) replacing the native food plants.

(Hedrick and Fredrickson, 2010; Ralls et al. 1988; Coltman et al. 1999). Fragmented and threatened populations exposed to these conditions increase their risk of extinction (Saccheri et al. 1998; Madsen et al. 1999; Frankham et al. 2010).

5.2 CHALLENGES

5.2.1 FINANCIAL RESOURCES

The funding allocated for species conservation in Nepal is unevenly distributed and more resource is channelized to the conservation of large and charismatic mammals, such as tiger, rhinoceros, etc. Blackbuck conservation is inadequately funded to achieve goals, objectives, and specific interventions to address threats and vulnerabilities by building capacities of field staffs and the concerned local communities. Recognizing the streams of goods and services that ecosystem and biodiversity provide for economic and social growth, building publicprivate partnership to invest in the protection and management of species, habitats, ecosystem, and genetic diversity along with sustainable use of resources, awareness, research, and law enforcement is imperative.

5.2.2 OPEN ACCESS & THEIR INTERACTION WITH HUMAN

The KrCA is surrounded by human settlements (north, south, and west), the roads (west) and a forest patch (east and north). People are living and using CA lands for cultivation since 1971; hence this situation has been creating conflicts between people and blackbuck conservation. On the other hand, open access in the conservation area has increased human disturbances to the species and its habitat.

Blackbucks frequently raid croplands inside and around the CA boundaries. Moreover, the scarcity of food plants and drinking water, search

5.2.4 INADEQUATE UPDATED KNOWLEDGE, RESEARCH, & AWARENESS

There is a plethora of research works on blackbuck and its habitat across its range. Yet updated information seems inadequate resulting in gaps in science-based intervention required for the conservation of this species. Evidence based research addressing the climate change adversities, rewilding, interactions, and genetic stability is required. Understanding on the for palatable food, porous boundary, excessive harvest of grasses for livestock, and cattle grazing are the sources of increasing conflicts between humans and blackbucks. Humans chasing blackbucks, hitting them with stones, and releasing dogs into core area of KrCA often lead to the injuries and deaths of blackbuck.

severity of blackbuck conservation issues is relatively poor at the decision-making levels, and policy makers are not well acquainted with the role of conservation ecology, population, and habitat dynamics as well as ecological importance of the species . Local communities are yet to gain the proper understanding of the importance of conservation of this species.

5.3 OPPORTUNITIES

5.3.1 COMMUNITY ENGAGEMENT

Conservation of blackbuck in KrCA started with the supports from local communities. Sadly, local people have benefitted less with the biodiversity and the healthy ecosystems in CA. Basic conservation education, diversification of local economy, and promotion of community-based organizations are the vital steps to conserve this species and improve the livelihoods in the vicinity.

5.3.2 NATURE-BASED TOURISM

Nature-based tourism in KrCA will play a vital role in conserving blackbuck and other co-existing fauna and flora, environmental protection, livelihood enhancement, and economic development in the area. KrCA can be developed as one of the popular destinations for native as well as visitors from across the border if the facilities such as quality accommodation,

meals, nature guide services, and tourismbased market for local products are improved. On an average 11,809 native visitors visited KrCA annually between 2071/72-2076/2077. The KrCA is now working closely with the local government, local communities, and other stakeholders to develop facilities in the vicinity of the CA to promote tourism.

5.3.3 RESEARCH AND MONITORING

For successful intervention in KrCA, adequate scientific research on biophysical, ecological, and socio-cultural aspects can serve as a tool to address conservation issues and challenges. Use of research findings to conservation and management contributes to successful conservation outcomes- from devising individual-specific diets to promoting life skills that enhance survival after reintroduction of species into the wild (Shier and Owings 2006, Vargas and Anderson 1999, Whiteside et al. 2015). Research contributes cost-effective guidance on effective conservation management. Studying animal behavior helps understand and predict the impacts of natural and anthropogenic disturbances on wild populations and serves as a powerful indicator of conservation problems (Berger-Tal et al. 2011).

5.3.4 SUPPORT FROM LOCAL AND PROVINCIAL GOVERNMENTS

Nepal is a federal democratic country since 2015. It has seven provincial and 753 local governments. In conformity with the federalism, the power shifts downwards to local governments and locally elected representatives bring more localized perspectives in the mainstream of development planning. There is an opportunity to mobilize their experience in the conservation to develop more environment friendly local development plans, and target investments to address conservation issues in and around KrCA. The KrCA lies along the partial land passing through Ward no. 1,2,3 and 4 of Gulariya Municipality in Lumbini Province.

Chapter VI BLACKBUCK CONSERVATION ACTION PLAN

6.1 GOAL

Maintain genetically viable population of blackbuck and secure it against emerging anthropogenic and climatic threats.

6.2 OBJECTIVES

Objectives of the plan and subsequent issues are as follows:

OBJECTIVE I

Enhance scientific knowledge on species ecology and habitat

ISSUES

- ▷ Limited science-based information on the species ecology and behavior, and response to natural and anthropogenic factors.
- ▷ Small population size and low genetic diversity.
- ▷ Inadequate forage availability in the dry season.
- ▷ Shrinking core habitat due to anthropogenic pressures.
- ▷ Increasing conflicts with humans.
- ▷ Invasive alien species and their impacts on natural habitat.
- ▷ More heavy metal in the groundwater.
- ▷ Inadequate veterinary facilities and services.
- ▷ Lack of proper fencing of the core area to protect the blackbuck from dogs and poachers.
- ▷ Adverse climate change impacts on habitat and blackbuck population.
- ▷ Lack of research on dynamics of prey-predator and KrCA-habitat.
- ▷ Lack of documentation on research findings and performed activities.

STRATEGY

- ▷ Upscale scientific research on ecology and behavior of the species using cutting-edge technology.
- ▷ Evaluate the response of species to different disturbances including climate induced hazards in their habitats and evaluate the threshold of their tolerance.
- ▷ Carry out detail study on carrying capacity, and spatial and temporal forage availability in the habitat.
- ▷ Determine anthropogenic disturbances and understand how species are coping with them.
- Document influence of the pattern of temperature and precipitation on demographic parameters of the species.

OUTPUT

- Species ecology including natality, demographic characteristics, pathogen, genetic diversity, space use and behavioral aspects of blackbuck studied and documented.
- Preferred forage plant species and availability of quality food in the available habitat well managed and ensured throughout the year.
- Outcomes of scientific research and monitoring protocols supported in designing and implementing blackbuck conservation programs efficiently.
- ▶ Adequate environmentally-safe space for the increasing population made.
- Existing and potential natural and anthropogenic threats including climate change impacts well assessed, and risk of climate change-induced hazards to blackbuck population significantly minimized.

- > Conduct regular monitoring of blackbuck population and associated predators.
- > Create and maintain a systematic data recording system on demographic parameters.
- ▷ Regularly monitor changes in habitat characteristics.
- ▷ Carry out genetic assessments of both wild and reintroduced populations.
- ▷ Conduct study on blackbuck ethology (mating, breeding, foraging and animal personality).
- ▷ Conduct correlative study on demographic parameters and climate change pattern.
- > Establish well equipped veterinary laboratory services.
- Conduct periodic pathological assessment.
- ▷ Maintain the health of blackbuck through regular health checkup and vaccination.
- ▷ Regularly monitor habitat condition focus on impact of climate change.
- > Identify all potential predators and locations of high predation areas using camera traps.
- Initiate comparative analysis of nutritional constituents of seasonally available food plants and supplementary food.
- > Explore other potential areas in Terai to establish new viable populations.
- Create artificial predator presence enclosure (e.g., potential dummy predator and sound) and animal for soft release.
- > Conduct periodic livestock vaccination in the adjoining area of the existing populations.
- Conduct spatial and temporal water quality assessment to avoid potential risk from arsenic.
- Prepare a site specific plan to address climate induced hazards (e.g., mounds in flood prone sites, ponds in water scarce sites, fire management in grass land during dry season).
- Produce audios, visuals and paper documents and disseminate among local communities and public.
- Engage local schools and community groups through regular interaction programs and KrCA visit to enhance conservation awareness.

OBJECTIVE II

Manage the habitat for enriching blackbuck population.

ISSUES

- Removal of illegal settlements and cultivation in core areas to provide adequate foraging space to the growing number of blackbucks.
- ▶ Proliferation of invasive alien plant species.
- ▷ Insufficient drinking water during the dry seasons.
- ▶ Lack of mechanism to supplement food during the food shortage season.
- > Habitat degradation and risk of disease transmission from feral cattle.
- Potential risk of climate change, such as high floods and prolonged drought during the summer season.

STRATEGY

Strengthening ongoing habitat management efforts.

OUTPUT

- Coordination with local and provincial governments to address illegal settlement and cultivation issue initiated.
- ▷ Critical habitat such grassland and wetland/waterholes managed.
- Several research focusing on blackbuck habitat conducted.
- Continued supply of clean drinking water ensured.

- Organize meetings at the local and provincial levels to address illegal settlement and cultivation in core area.
- ▶ Remove invasive and other unpalatable plant species.
- Maintain short grassland and/or grazing lawns through regular cutting, controlled burning, and grazing.
- Establish additional earthen mounds and regularly maintain existing mounds in KrCA and build similar flood refugia in Hirapur, ShNP.
- ▶ Provide supplement diet to fulfil nutritional requirement.
- ▶ Monitor existing habitat (grassland and wetland) regularly.
- ▶ Ensure regular supply of clean drinking water during the dry season.
- Develop water channel of northwestern part of KrCA as a wetland with perennial source of water.
- ▷ Construct new waterholes/wetlands in strategic locations.
- Promote stall feeding to reduce the grazing pressure.
- ▷ Create zonation of core area and monitor different zones regularly.
- > Expand existing habitat in Hirapur to accommodate additional animals.
- ▶ Explore suitable habitats in and around lowland PAs for future translocation.

OBJECTIVE III

Harmonize and strengthen local stewardship for blackbuck conservation.

ISSUES

- ▷ Increasing conflicts between blackbuck conservation and local communities.
- ▶ Immense anthropogenic disturbances in KrCA.
- ▶ Encroachment of KrCA for settlement and cultivation.
- ▶ Poor tourism facilities.
- ▶ Inadequate conservation awareness among local communities.
- ▶ High community dependency on KrCA for daily movement of local people, grazing livestock, and cultivation.
- Predation of blackbuck by feral dogs.
- Poverty and limited livelihood options.

STRATEGY

- ▶ Develop comprehensive solutions to address conflict-related issues.
- ▷ Initiate periodic study on the effectiveness of human- blackbuck conflict mitigation measures.
- ▶ Identify and document the role of cultural beliefs and taboos in blackbuck conservation.
- ▶ Resolve existing encroachment problem through package programs with high priority.
- Assess attitudes of local communities and the effectiveness of blackbuck conservation awareness programs.
- ▶ Provide supports to develop adequate facilities to promote ecotourism.
- > Management of feral dogs in coordination with veterinary units of local bodies.
- Conduct program related to improved cattle breed to replace unproductive cattle in coordination with line agencies.

OUTPUT

- ▷ Community livelihood improved through eco-tourism and alternative livelihoods.
- ▶ Positive attitude and behavior towards blackbuck conservation demonstrated by locals.
- ▶ Human- blackbuck conflict reduced.
- Illegal settlements' issues addressed
- ▷ Controlled seasonal cattle grazing practice outside core habitat established and regulated.
- ▷ Alternative road/ trails inside KrCA built.
- ▶ Integrated conservation and development activities institutionalized.
- Risk of predation from feral dogs reduced.
- ▷ Overgrazing by feral cattle reduced.

- Recognize communities as legitimate resource users for sustainable use of CA resources e.g., collection of tall grasses for stallfeeding of their livestock.
- Respect the user rights, social bonds, and collective actions of communities and incorporate their knowledge, techniques, and management regime for conflict minimization.
- Apply various forms of community relief support mechanism to minimize damage caused by blackbuck.

- Develop a system of sharing responsibility and rights among stakeholders to address the complexity of conflicts in KrCA.
- Conduct conservation awareness activities, such as radio program, workshops, blackbuck festival, and blackbuck march, etc. by ensuring with the participation of women, youth, people from indigenous and marginalized groups.
- ▷ Conduct integrated conservation and development activities.
- Promote and strengthen community-based tourism (home stay, village tour, cart riding, local dishes, etc.) in neighboring villages. Train local youths in nature guide, cooking, hospitality, and house keeping.
- ▶ Promote cash crop cultivation in the vicinity of KrCA.
- Support community to mitigate potential human blackbuck conflict, and undertake periodic study on the effectiveness of conflict mitigation measures.
- ▶ Provide seedling/saplings of seasonally growing fodder plants.
- Promote alternative energy (e.g., biogas, improved cooking stoves) to reduce use of firewood and for in-house health safety.
- Resolve the issues of registered land, illegal settlements and other encroachments in KrCA through legal instruments.
- ▷ Offer eco-tourism activities such as nature walk, bird watching etc. inside the KrCA.

OBJECTIVE IV

Develop research and monitoring guidelines for releasing captive blackbuck in the wild.

ISSUES

- ▶ Fluctuating trend of blackbuck population which may lead to local extinction.
- Preserving genetic diversity of localized blackbuck populations.
- Unregulated introduction/re-introduction, or translocation for maintaining genetically viable populations of blackbuck.
- ▶ Inadequate intensive studies on habitat dynamics, ecology, and animal behavior.

STRATEGY

- Develop strategies to cope with the climate change-induced impacts such as fire, flood, and drought, etc.
- Establish a DNA bank for the preservation of living sperms, eggs, embryos, tissues, chromosomes, and DNA for the short and long term studies.
- ▷ Undertake scientific assessment of new sites for blackbuck translocation in the country.
- ▷ Continue reintroduction in former ranges and translocate in other potential areas.

OUTPUT

- ▷ Mechanism to control fire during prolonged drought period established.
- ▷ Artificial ponds built to regularly supply clean drinking water during dry seasons.
- Early preparation to minimize the impact of high floods on species and habitat during monsoon made.
- > Ex-situ conservation and releasing captive blackbuck in wild monitoring guidelines prepared.

- ▷ A feasibility study to establish a DNA bank in Nepal is conducted.
- ▷ Sub-population of blackbuck in their former range and other potential habitat established.
- ▷ Study reports of possibility of releasing blackbuck of Hirapur Phanta.

- > Develop guidelines for releasing captive blackbuck in the wild.
- ▷ Develop monitoring guidelines for pre and post observations of released individual.
- ▶ Use modern technology to understand animal behavior.
- ▷ Reintroduce blackbuck in other former ranges and potential habitats outside PA.

OBJECTIVE V

Establish sustainable financing mechanism.

ISSUES

- ▷ Inadequate financial resources to manage KrCA.
- ▶ High cost for maintaining fences.
- A limited number of visitors.
- ▶ Little conservation and management priority.

STRATEGY

- ▷ Lobby for additional financial supports from federal government.
- ▶ Explore funding sources from NGOs, INGOs and the private sector.
- ▶ Develop tourism facilities in the vicinity of the KrCA to attract visitors.
- Develop guidelines for collecting fees from visitors and communities, and people who benefit from the ecosystem services of the PAs.
- Develop partnership with the provincial and local level governments, and private sector to leverage additional fund.
- ▷ Develop and implement a mechanism to raise and sustain required fund.
- ▷ Foster coordination and collaboration with potential conservation partners for leveraging financial resources.

OUTPUT

- ▶ Financial resources for blackbuck conservation ensured.
- ▶ Funding mechanism at national and site levels developed.
- Incentive-based approach developed and adopted.

- ▷ Seek funding opportunities with potential national and international donors.
- Secure budget from all levels of government (Federal/Provincial/Local) by devising species conservation action plan.
- ▷ Identify relevant institutions including private sector and develop institutional mechanisms for effective collaboration.
- Develop research proposals jointly with conservation partners to raise sufficient funds for the implementation of the action plan.
- Promote domestic as well as foreign visitors.
- ▶ Create an emergency fund for crisis management.

PLAN IMPLEMENTATION AND MONITORING

7.1 IMPLEMENTING AGENCY

The DNPWC will take a lead role in the overall implementation of this conservation action plan. DNPWC will coordinate with the federal, provincial, and local governments for the support and implementation of this plan. Moreover, the conservation partners will contribute to implement this action plan. IUCN, NTNC, WWF, ZSL, and universities will support the scientific research in partnership and coordination with DNPWC. Other likeminded research organizations and individuals will also be facilitated to involve and support for conducting research.

7.2 FINANCIAL PLAN

This section of action plan provides indicative financial resources required to implement the activities specified in the action plan. Total estimated cost for the implementation of the action plan is NPR 17,43,35,000 (Table 2). The fund will be managed from government's regular budget, and supports from conservation partners (WWF, NTNC, IUCN, and ZSL), and local as well as provincial governments. The other national and international conservation organizations will also be encouraged to provide funding support to implement the plan. Detail breakdown of the proposed budget is presented in the annex 1.

Table 2: Summary of the Indicative Budget						
OD IECTIVE AND ACTIVITIES		BUDG	Total			
ODJECTIVE AND ACTIVITIES	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Budget (NPR)
Enhance scientific knowledge on species ecology and habitat	19,650	8,050	7,550	6,750	11,900	53,900
Manage the habitat for the blackbuck population	3,850	5,260	3,170	2,980	2,990	18,250
Harmonize and strengthen local stewardship for blackbuck conservation	6,100	3,650	5,600	4,050	6,100	25,500
Develop research and monitoring guidelines for releasing captive black- buck in the wild	500	1,800			1,000	3,300
Establish sustainable financing mechanism	11,225	200	725	10,700	725	23,575
Sub-Total	41,325	18,960	17,045	24,480	22,715	1,24,525
Administrative cost (40%)	16,530	7,584	6,818	9,792	9,086	49,810
Total Budget (NPR)	57,855	26,544	23,863	34,272	31,801	1,74,335

Table 1: Summary of the Indicative Budget

7.3. MONITORING OF THE PLAN IMPLEMENTATION

DNPWC will be responsible for monitoring the implementation of this action plan. Annual progress of action plan implementation will be reflected in the annual progress reports of KrCA, ShNP and DNPWC. On top of that, photo and video documentation will be the integral component of the monitoring reports. This action plan will be reviewed towards the end of the plan by DNPWC in coordination with DoFSC and conservation partners. If deemed necessary, a mid-term review of the action plan will also be conducted. The findings and learning from these periodic reviews will be incorporated into the next action plan.

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ANNEXES

ANNEX 1: LOGICAL FRAMEWORK OF GOAL, OBJECTIVES, AND INDICATORS

Objectives/Activities	Indicators	Means of Verification	Risk/Assumption				
Goal: Maintain genetically	Goal: Maintain genetically viable population of blackbuck and secure them against emerging anthropogenic and climatic threats.						
ENHANCE SCIENTIFI	OBJECTIVE IC KNOWLEDGE ON SP	1 PECIES ECOLOGY ANI) HABITAT.				
Outputs							
Species ecology including natality, demographic characteristics, pathogen, genetic diversity, space use and behavioral aspects of blackbuck studied and documented.	Information on biology, demography, diseases, and genetic diversity is available.	Research papers, reports, thesis.	It is assumed that blackbuck study and research continues to receive adequate attention for funding at national				
Preferred forage plant species and quality food in the habitat ensured throughout the years.Information on spatial and temporal forage is available.		Research papers, reports, thesis.	and international level				
Outcomes of scientific research and monitoring support in designing and implementing blackbuck conservation programs efficently.	Projects on research and conservation of blackbuck and habitat.	Number of conservation projects from conservation agencies/ conservationists.					
Adequate environmentally space for the increasing population made.	Introduction programs to potential habitats.	Surviving/viable sub-populations.					
Existing and potential anthropogenic threats including climate change impacts well assessed, and risk of climate change-induced hazards to blackbuck population significantly minimized.	Construction of structures like fences, mounts in flood prone area, water ponds in water scarce area.	Less causality from conflict with people, flood.					

- ▷ Conduct regular monitoring of blackbuck population and its associated predators.
- ▷ Create and maintain systematic data recording system on demographic parameters.
- ▶ Regularly monitor changes in habitat characteristics.
- ▷ Carry out genetic assessments of both wild and reintroduced populations.
- ▷ Conduct study on blackbuck ethology (mating, breeding, foraging and animal personality).
- ▷ Conduct correlative study on demographic parameters and climatic patterns.
- ▶ Establish well equipped veterinary laboratory services.
- ▶ Conduct periodic pathological assessment.
- ▶ Maintain the health of blackbuck through regular health checkup and vaccination.
- ▶ Regularly monitor habitat condition focus on impact of climate change.
- ▶ Identify all potential predators and locations of high predation areas using camera traps.
- Initiate comparative analysis of nutritional constituents of seasonally available food plants and supplementary food.
- > Explore other potential areas in Terai to establish new viable populations.
- Create artificial predator presence enclosure (e.g., potential dummy predator and sound) and animal for soft release.

- ▷ Conduct periodic livestock vaccination in the adjoining area of the existing populations.
- ▷ Conduct spatial and temporal water quality assessment to avoid potential risk from arsenic.
- Prepare a site-specific plan to address climate induced hazards (e.g., mounds in flood prone sites, ponds in water scarce sites, fire management in grass land during dry season).
- Produce audios, visuals and paper documents and disseminate among local communities and public.
- Engage local schools and community groups through regular interaction programs and KrCA visit to enhance conservation awareness.

Objectives/Activities	Indicators	Means of Verification	Risk/Assumption				
MANAGE THE HAB	OBJECTIVE 2 MANAGE THE HABITAT FOR ENRICHING BLACKBUCK POPULATION.						
Outputs							
Coordination with local and provincial governments to address illegal settlement and cultivation issue initiated.	No. of illegal settlement and area of illegal cultivation removed.	Photographs, reports.					
Critical habitat such grassland and wetland/waterholes targeting blackbuck population are managed.	No. of hectares of grassland managed and no. of waterholes constructed.	Photographs, reports.	Grasslands and wetlands are managed focusing species ecology and best management practices.				
Several research focusing on blackbuck habitat conducted.	No. of research reports, number of research permits on blackbuck and its habitat.	Research reports.					
Continued supply of clean drinking water ensured.	No. of waterholes/ drinking source sustained throughout the year.	Photographs, reports.					

- Organize meetings at the local and provincial levels to address illegal settlement and cultivation in core area.
- ▶ Remove invasive and other unpalatable plant species.
- ▷ Maintain short grassland and/or grazing lawns through regular cutting, controlled burning, and grazing.
- ▷ Establish additional earthen mounds and regularly maintain existing mounds in KrCA and build similar flood refugia in Hirapur, ShNP.
- ▷ Provide supplement diet to fulfil nutritional requirement.
- ▷ Monitor existing habitat (grassland and wetland) regularly.
- ▷ Ensure regular supply of clean drinking water during the dry season.
- ▷ Develop water channel of northwestern part of KrCA as a wetland with perennial source of water.
- Construct new waterholes/wetlands in strategic locations.
- ▶ Promote stall feeding to reduce the grazing pressure.
- ▷ Create zonation of core area and monitor different zones regularly.
- Expand existing habitat in Hirapur to accommodate additional animals.
- ▷ Explore suitable habitats in and around lowland PAs for future translocation.

Objectives/Activities	Indicators	Means of Verification	Risk/ Assumption
HARMONIZ I			
Outputs			
Community livelihood improved through eco-tourism and alternative livelihoods.	No. of local people benefitted from blackbuck based entrepreneurship and tourism increased.	Annual reports of DNPWC, protected areas and conservation partners.	
Positive attitude and behavior towards blackbuck conservation demonstrated by locals.	No. of local people having positive perception towards blackbuck conservation through interviews and actions.	Annual and research reports.	
Human- Blackbuck conflict reduced.	Fencing around the CA/ timely compensation to crop depredation.	Annual reports of DNPWC, protected areas and conservation partners.	
Illegal settlements' issues addressed.	CA is increased.	Completion report.	
Controlled seasonal cattle grazing outside core habitat established and regulated.	Grazing is regulated.	Annual reports of KrCA council and KrCA office.	
Alternative to road/ trails inside	Physical progress.	Annual reports of the KrCA.	
Integrated conservation and development activities institutionalized.	Physical progress.	Annual reports of the KrCA.	
Risk of predation from feral dogs reduced.	No. of deaths/injuries by feral dogs.	Reports.	
Overgrazing by feral cattle reduced.	Trends of grazing by feral cattle.	Reports.	

- Recognize communities as legitimate resource users for sustainable use of CA resources e.g., collection of tall grasses for stallfeeding of their livestock.
- Respect the user rights, social bonds, and collective actions of communities and incorporate their knowledge, techniques, and management regime for conflict minimization.
- ▷ Apply various forms of community relief support mechanism to minimize damage caused by blackbuck.
- Develop a system of sharing responsibility and rights among stakeholders to address the complexity of conflicts in KrCA.
- Conduct conservation awareness activities, such as radio program, workshops, blackbuck festival, and blackbuck march, etc. by ensuring with the participation of women, youth, people from indigenous and marginalized groups.

- ▷ Conduct integrated conservation and development activities.
- Promote and strengthen community-based tourism (home stay, village tour, cart riding, local dishes, etc.) in neighboring villages Train local youths in nature guide, cooking, hospitality, and house keeping.
- ▶ Promote cash crop cultivation in the vicinity of KrCA.
- Support community to mitigate potential human blackbuck conflict and undertake periodic study on the effectiveness of conflict mitigation measures.
- Provide seedling/saplings of seasonally growing fodder plants.
- Promote alternative energy (e.g., biogas, improved cooking stoves) to reduce use of firewood and for in-house health safety.
- Resolve the issues of registered land, illegal settlements and other encroachments in KrCA through legal instruments.
- ▷ Offer eco-tourism activities such as nature walk, bird watching etc. inside the KrCA.

Objectives/Activities	Indicators	Means of Verification	Risk/Assumption			
OBJECTIVE 4 DEVELOP RESEARCH AND MONITORING GUIDELINES FOR RELEASING CAPTIVE BLACKBUCK IN THE WILD .						
Outputs						
Mechanism to control fire during prolonged drought period established.	Number of fire control mechanisms.	Reports.				
Artificial ponds built to regularly supply clean drinking water during dry seasons.	Construction of ponds.					
Early preparation to minimize the impact of high floods on species and habitat during monsoon made.	Mounds for protection against flood.					
Ex-situ conservation and releasing captive blackbuck in wild monitoring guidelines prepared.	Ex-situ and rewilding guideline preparation.					
A feasibility study to establish a DNA bank in Nepal is conducted.		Reports.				
Sub-population of blackbuck in their former range and other potential habitat established.	Periodic trends of translocated blackbuck populations.	Reports.				
Study report of possibility of releasing blackbuck of Hirapur Phanta.		Reports.				

- ▶ Develop guidelines for releasing captive blackbuck in the wild.
- ▶ Develop monitoring guidelines for pre and post observations of released individual.
- Use modern technology to understand animal behavior.
- ▷ Reintroduce blackbuck in other former ranges and potential habitats outside PA.



Objectives/Activities	Indicators	Means of Verification	Risks/Assumption				
OBJECTIVE 5 ESTABLISH SUSTAINABLE FINANCING MECHANISM.							
Outputs							
Financial resources for blackbuck conservation ensured.	Current budget on blackbuck research and conservation increased.	Reports of DNPWC, DoFSC and other conservation partners					
Funding mechanism at national, and site levels developed.	No. of meetings organized at national/ international, transboundary, and state level increased. Current budget on blackbuck research and conservation increased.	Reports of DNPWC, DoFSC and other conservation partners.					
Incentive-based approaches developed and adopted.	Suitable plan is prepared and implemented for the incentives.	Office records.					

- ▷ Seek funding opportunities with potential national and international donors.
- Secure budget from all levels of government (Federal/Provincial/Local) by devising species conservation action plan.
- ▶ Identify relevant institutions including private sector and develop institutional mechanisms for effective collaboration.
- Develop research proposals jointly with conservation partners to raise sufficient funds for the implementation of the action plan.
- ▶ Promote domestic as well as foreign visitors.
- ▷ Create emergency fund for crisis management.

ANNEX 2: FIVE YEAR ANNUAL INDICATIVE BUDGET FOR BLACKBUCK CONSERVATION ACTION PLAN

	BUDGET (000) NPR					Total
OBJECTIVE AND ACTIVITIES	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Budget (NPR)
Goal: Maintain genetically viable po	pulation	of black	buck and	i secure i	it agains	t emerging
anthropo	genic and	d climat	ic threats	5.		
ENHANCE SCIENTIFIC KNOW	OBJEC LEDGE	ON SPEC	IES ECO	LOGY AN	ND HABI	TAT.
Conduct regular monitoring of Blackbuck population and associated predators	50	50	50	50	50	250
Create and maintain systematic data recording system on demographic parameters.	250	25	25	25	25	350
Establish and maintain database on population and habitat.	250	25	25	25	25	350
Carry out genetic assessments of both wild and reintroduced population.		700			700	1,400
Conduct study on Blackbuck ethology (mating, breeding, foraging, animal personality).	500				500	1000
Conduct correlative study on demographic parameters and climatic pattern.			500			500
Establish equipped veterinary laboratory services with periodic pathological assessment.	2,000	100	100	100	1,000	3,300
Conduct experimental study to identify potential nutritious food plant species.		800				800
Establish permanent plots to monitoring palatable grass condition.	300	50	50	50	300	750
Identify key predation sites through camera trapping survey.	500			500		1,000
Initiate comparative analysis of nutritional constitutes of seasonally preferred grasses and supplement food.		300			300	600
Elaborate community-based land-use plans within sites and in buffer zone.	500		500			1,000
Create new additional viable population in other areas in the Terai by reintroduction program (e.g., Barandabhar Corridor Forest, Chitwan).	10,000	5,000	5,000	5,000	5,000	30,000
Undertake regular research and monitoring and explore possible area elsewhere in Terai to establish additional viable population.	300		300			600
Create artificial predator presence enclosure (e.g., potential dummy predator and sound) and animal for soft release.	3,000				3,000	6,000
Conduct periodic livestock vaccination campaign in the adjoining area.	500	500	500	500	500	2,500
Conduct spatial and temporal water quality assessment (e.g., Arsenic).	1,500	500	500	500	500	3,500

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OBJECTIVE AND ACTIVITIES	Vn 1	BUDO	GET (000) NPR	Vn 5	Total Budget
	OBJEC	TIVE 2	11. 3	16.4	11. 5	(NPR)
Identification and mapping of suitable habitat along the major PAs in the lowland areas of Nepal.	DR ENRI 400	CHING E	BLACKBU	JCK POP	ULATIO	N. 400
Uproot unpalatable species and invasive species.	1,000	1,000	1,000	1,000	1,000	5,000
Maintain short grassland and/or grazing lawn through regular cutting, controlled buning, and grazing.	2,000	2,000	2,000	2,000	2,000	10,000
Establish new earthen mounds in ShNP/KrCA, and maintain existing mounds in KrCA.	500	2,500	500	500	500	4,500
Provide supplement diet to offsets nutritional issue.	100	110	120	130	140	600
Monitor existing habitat (grassland and wetland) regularly.	50	50	50	50	50	250
Ensure smooth supply of water through out the year.	100	100	100	100	100	500
Construction of new waterholes/ wetlands.	200		200			400
Promote stall feeding of livestock to reduce the grazing pressure especially from feral cattle.	200	200	200	200	200	1,000
Conduct research focusing on blackbuck habitat after zonation of habitat within core area.	200	200				400
Extended habitat in Hirapur Phanta.	100	100				200

OBJECTIVE AND ACTIVITIES	BUDGET (000) NPR					Total
	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Budget (NPR)
OBJECTIVE 3 HARMONIZE AND STRENGTHEN LOCAL STEWARDSHIP FOR BLACKBUCK CONSERVATION.						
Consider local communities as legitimate resource users and provide access for sustainable use of CA resources.	400					400
Respect the users' rights, social bond, and collective actions of communities and incorporate their knowledge, techniques for conflict minimization.	50		50		50	150
Apply various forms of mitigation measures to minimize crop raiding.	500	500	500	700	700	2,900
Sharing of responsibility and rights among stakeholders in the Conservation Area concerning the complexity of conflicts.	50	50	50	50	50	250
Generate collective actions to manage resources under certain rules towards conservation targets.	100	100		100	100	400
Conduct awareness activities for blackbuck conservation (radio program, workshops, blackbuck festival, Blackbuck March etc.)	800	800	900	900	900	4,300
Promote and strengthen community- based tourism (home stay) in neighboring villages.	1,000		1,000		1,000	3,000
Train community members in nature guiding, cooking, hospitality, and house management.	1,000		1,000		1,000	3,000
Encourage community member in cash crop production.	100	100	100	200	200	700
Support community to mitigate potential human -Blackbuck conflict	1,000	1,000	1,000	1,000	1,000	5,000
Support and promote stall feeding of livestock.	100	100		100	100	400
Provide seedling/saplings of seasonal growing fodder plants to community.	300	300	300	300	300	1,500
Promote alternative energy (e.g., biogas, improved cooking stoves).	700	700	700	700	700	3,500

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OBJECTIVE AND ACTIVITIES		Total					
	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Budget (NPR)	
OBJECTIVE 4 DEVELOP RESEARCH AND MONITORING GUIDELINES FOR RELEASING CAPTIVE BLACKBUCK IN THE WILD.							
Develop guidelines for capturing and releasing in wild techniques.		800				800	
Develop monitoring guidelines for pre and post monitoring of released individuals.	500					500	
Use collar for the released individuals.		1,000			1,000	2,000	

OBJECTIVE AND ACTIVITIES	BUDGET (000) NPR					Total
	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Budget (NPR)
OBJECTIVE 5 ESTABLISH SUSTAINABLE FINANCING MECHANISM.						
Seek funding opportunities with potential national and international donors.	500			500		1,000
Secure government (Central/ Provincial/Local) funding by mainstreaming the action plan into the regular plan and program.	100	100	100	100	100	500
Identify relevant institutions and develop mechanisms for effective collaboration.	25		25		25	75
Develop research proposals jointly with conservation partners to raise sufficient funds for the implementation of the action plan.	500		500		500	1,500
Promote domestic visitors (e. g., School/University students).	100	100	100	100	100	500
Create emergency fund for crisis management.	10,000			10,000		20,000



