



WILD WATER BUFFALO (*BUBALUS ARNEE*) CONSERVATION ACTION PLAN FOR NEPAL (2020-2024)



GOVERNMENT OF NEPAL

MINISTRY OF FORESTS AND ENVIRONMENT

Department of National Parks and Wildlife Conservation

Kathmandu

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



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Foreword

Wild water buffalo (“Arna” in Nepali) is one of the endangered mammals with its founder population found in floodplain habitat of Koshi Tappu Wildlife Reserve. In 2017, Government of Nepal made a maiden effort to establish satellite population of the species in Chitwan National Park which is also its former ranging habitat. Wild water buffalo is listed at the protected mammals list under the NPWC Act, 2029 (1973). Nepal National Biodiversity Strategy and Action Plan (NBSAP, 2014-2020) has also emphasized the priority actions for conserving endangered species including Wild buffalo.

Wild water buffalo conservation is facing threats including population inbreeding; gene pool erosion with domestic buffalo; disease from domestic livestock and recurring floods. Illegal grazing of local livestock in the core area habitat has also been a major nuisance. Holistic plan to provide guidance and address the issues looming over the species survival and its habitat integrity were lacking. Wild Water Buffalo Conservation Action Plan (2020-24) is the first-ever action plan for the species to conserve viable and ecologically functioning populations and maintaining its genetic integrity in harmony with local people. This action plan will continue to provide crucial guidance to implement priority conservation initiatives which will benefit species, habitat and communities.

I sincerely thank the technical team of the Department of National Parks and Wildlife Conservation for preparing this Action plan, USAID’s Hariyo Ban Program through WWF Nepal for providing financial support. The Government of Nepal greatly acknowledges the contribution of wildlife conservation partners and expects its continuous support and commitment to the successful implementation of this plan.

I am confident that this action plan will contribute in conservation and management of the wild water buffalo and its habitat in Nepal.

Ram Chandra Kandel, PhD

Officiating Director General

Department of National Parks and Wildlife Conservation

Abbreviations & Acronym

BCN	Bird Conservation Nepal
BNP	Bardia National Park
BS	Bikram Sambat
BZ	Buffer Zone
BZCF	Buffer Zone Community Forest
BZUC	Buffer Zone Users Committee
BZUG	Buffer Zone Users Group
BZMC	Buffer Zone Management Committee
CBAPU	Community Based Anti-Poaching Unit
CCTV	Closed Circuit Television
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CNP	Chitwan National Park
CSUWN	Conservation and Sustainable Use of Wetlands in Nepal
Cusec	Cubic foot per second
DNPWC	Department of National Parks and Wildlife Conservation
DoFSC	Department of Forests and Soil Conservation
GEF	Global Environment Facility
HHs	Households
FMD	Foot and Mouth Disease
GoN	Government of Nepal
Ha.	Hectare
HBP	Hariyo Ban Program
IUCN	International Union for Conservation of Nature
Kg	Kilogram
Km ² (sq. km)	Square kilometers
KTWR	Koshi Tappu Wildlife Reserve
lbs	Pound
m	Meters
M/F	Male/Female
MoFE	Ministry of Forests and Environment
NA	Nepal Army
NBSAP	Nepal National Biodiversity Strategy and Action Plan (2014-2020)
NPR	Nepali Rupees
NPWC	National Parks and Wildlife Conservation
NTNC	National Trust for Nature Conservation
NWCCCC	National Wildlife Crime Control Coordination Committee
PA	Protected Area
PCP	Participatory Conservation Program
PPP	Park People Program
SAWEN	South-Asia Wildlife Enforcement Network
UNDP	United Nations Development Program
USAID	United States Agency for International Development
VDCs	Village Development Committees
WCCB	Wildlife Crime Control Bureau
WWF	World Wildlife Fund
WWT	Wildfowl and Wetland Trust
ZSL	Zoological Society of London

Executive Summary

The Wild Water Buffalo or Asiatic Wild Water Buffalo or Arna (*Bubalus arnee*) is listed as 'endangered' species in the IUCN Red Data Book and is a protected wildlife of Nepal. It is included in Appendix III of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). It is a large ungulate and herd loving mega herbivores and prefers to graze from morning to evening and wallows in the afternoon to beat the heat. It is only harbored in Koshi Tappu Wildlife Reserve, Nepal and recently it is translocated to Chitwan National Park in 2017.

Wild Water Buffaloes were once widely distributed across South and South-east Asia from Mesopotamia to Indo-China. They are now restricted to small pockets in scattered populations in Nepal, India, Bhutan and Myanmar. The genetic integrity of remnant population in Western Thailand, Cambodia, and Sri Lanka is thought to be debatable. The major populations of Asian Wild Water Buffaloes are found in India at Kaziranga National Park in Assam and Indravati Wildlife Sanctuary in Madhya Pradesh. At present, there are 3,300-3,400 population thriving in Wild Water Buffalo bearing countries.

Wild Water Buffaloes were reported to occur in Koshi Tappu Wildlife Reserve from mid to late 1950s, whereas, its population in Chitwan National Park was found until early 1960s and it is assumed that they were extinct due to disease transferred by local livestock. The Wild Water Buffalo population of Koshi Tappu Wildlife Reserve was the last remaining population of Nepal until 15 individuals were translocated to old Padampur of Chitwan National Park in 2017. Dahmer (1978) carried out first census of Wild Water Buffalo just after establishment of KTWR in 1976 and found 63 individuals. Then after, censuses have been carried out in a regular interval, generally in every five years. The Wild Water Buffalo census carried out in BS 2074 (2018) recorded 441 individuals with 191 female adults. Heinen (1993) pointed out the death of Wild Water Buffalo, both calves and adult, from extreme flooding during the monsoon as a major challenge and hence proposed to translocate them to its former habitats mainly Chitwan National Park to maintain alternate population of Wild Water Buffalo. After three decades of recommendations by various experts, translocation of 15 Wild Water Buffaloes took

place from Koshi Tappu Wildlife Reserve to Chitwan National Park in 2017.

Due to an isolated pocket population, there are many threats and challenges towards Wild Water Buffalo conservation in KTWR such as: population inbreeding, gene pool erosion with domestic buffalo, and disease from domestic livestock and recurring floods. Conservation of Wild Water Buffaloes was initiated with the establishment of Koshi Tappu Wildlife Reserve in 1976. However, illegal grazing of local livestock in the core area has been a major problem since its establishment. Every day, around thousands of livestock are found grazing together with Wild Water Buffalo (KTWR, 2018). The continued practice of illegal grazing by the livestock and unclaimed feral cattle have made the management of the species difficult. In 2001, 167 domestic buffaloes were shot by KTWR authority to communicate and warn buffalo owners not to graze their animals illegally. However, feral cattle problem cannot be solved due to its sacred status. The culling of feral buffaloes was stopped due to controversy as domestic buffaloes were also killed. In 2005, feral cattle were evacuated for the first time with the joint sweeping efforts of Reserve, Nepal Army, and Buffer Zone (BZ) communities, and it was repeated in 2010. The inadequate number of Reserve posts and Nepal Army camps including the staffs and inadequate support from political parties has led the illegal grazing very complex. In Koshi Tappu Wildlife Reserve, various projects have been implemented to improve and maintain human-wildlife amity and contribute towards Wild Water Buffalo conservation. Out of them, contribution of UNDP supported Park and People Program in 1994, Participatory Conservation Program in 2002, IUCN Nepal in 2004, Bird Conservation Nepal in 2006, Conservation and Sustainable Wetlands in Nepal in 2008 and National Trust for Nature Conservation in 2015 are noteworthy.

This action plan is primarily guided by the Nepal National Biodiversity Strategy and Action Plan (2014 - 2020) and Protected Area (PA) management plans of Wild Water Buffalo bearing PAs of Nepal. The plan will be implemented to address long-term conservation of Wild Water Buffalo in Nepal. The overall goal of the plan is to conserve viable and ecologically functioning populations thereby maintaining genetic integrity of Wild Water Buffalo in harmony with local people.

To achieve this goal, the PAs will emphasize to conserve Wild Water Buffalo employing appropriate strategy and manage their habitat applying science-based management interventions. The specific objectives of the Action Plan are:

- ▶ Improve and expand the habitat of KTWR to provide adequate forage and wallowing sites to ensure viability and ecological functionality of Wild Water Buffalo population;
- ▶ Conserve Wild Water Buffalo population by prohibiting illegal grazing of domestic buffalo and cattle to control competition, disease transmission, genetic introgression and releasing the translocated population in the wild;
- ▶ Maintain amity between human and wildlife by promoting participatory Wild Water Buffalo conservation;
- ▶ Conserve viable population of Wild Water Buffalo by enhancing understanding and knowledge on conservation status, ecology, population biology, habitat dynamics and genetic integrity of Wild Water Buffalo; and

- ▶ Strengthen human, financial, and technical resources for conserving Wild Water Buffaloes

The plan aims to achieve the above-mentioned objectives through specific interventions in: Habitat management; Species conservation; Human-Wild Water Buffalo amity; Studies, research and monitoring; and Institutional strengthening. The total estimated budget of the proposed plan is NRs. 168,359,000.00 (One hundred sixty-eight million three hundred fifty-nine thousand) for the five years. The action plan gives much weightage to habitat management which includes the extension of the Reserve which is 51.53% of the total budget. Similarly, the plan focuses on Wild Water Buffalo conservation with 29.26% of budget allocation.

It is expected that Wild Water Buffalo bearing PAs will tap the resources from Provinces, and local governments and conservation partners will also provide support to implement the activities mentioned in Action Plan.

Table of Contents

Abbreviations and Acronyms.....	iv
Executive Summary.....	v
Chapter I	
Introduction.....	1
1.1 Relevancy of the Action Plan	1
1.2 Action Plan Development Process	1
1.3 Scope of the Action Plan.....	1
Chapter II	
Background	3
2.1 Global Status and Distribution of Wild Water Buffalo	3
2.2 Nepal's National Status of Wild Water Buffalo and its Distribution	4
2.3 Natural History	5
2.4 Ecology.....	6
Chapter III	
Conservation Efforts and Achievements.....	9
3.1 National Conservation Policy.....	9
3.2 Conservation Efforts	9
3.3 Translocation of Wild Water Buffaloes.....	11
3.4 Expansion of KTWR.....	11
3.5 Community Involvement	12
Chapter 4	
Threat, Challenges and Issues	13
4.1 Threat	13
4.1.1 Flooding.....	13
4.1.2 Genetic Erosion	13
4.1.3 Risk of Disease Transmission	13
4.2 Challenges	14
4.2.1 Feral Cattle and Illegal Livestock Grazing.....	14
4.2.2 Encroachment	15
4.2.3 Unsustainable Harvesting of Forest Products.....	15
4.2.4 Invasive Species.....	15
4.2.5 Forest Fire	16
4.2.6 Shrinking Habitat	16
4.3 Issues	16
4.3.1 Regulation of Forest Resources	16
4.3.2 Conversion of Grassland into Woodland	16
4.3.3 Repair and Maintenance of Solar Fence.....	16
4.4 Opportunities.....	16

Chapter V

Wild Water Buffalo Conservation Action Plan	17
5.1 Goal	17
5.2 Objectives	17
5.2.1 Objective 1	17
5.2.2 Objective 2	18
5.2.3 Objective 3	19
5.2.4 Objective 4	20
5.2.5 Objective 5	21

Chapter VI

Activity, Budget and Logical Framework.....	23
6.1 Activity, Budget, and Logical Framework	23
6.2 Logframe of the Action Plan.....	24

Chapter VII

Plan Implementation and Monitoring	33
7.1 Implementing Agency	33
7.1.1 Human Resources and Capacity Development	33
7.1.2 Governance	33
7.1.3 Coordination.....	33
7.2 Financial plan	34
7.3 Monitoring and Evaluation of Plan Implementation.....	34

References.....	35
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Annexes	37
Annex I: Detail Breakdown of Five-year Activities of Action Plan.....	37
Annex II: The Number of Wild Water Buffalo in Nepal	44

Introduction

1.1 Relevancy of the Action Plan

The Wild Water Buffalo or Asiatic Wild Water Buffalo or Arna (*Bubalus arnee*) is listed as protected wildlife in National Parks and Wildlife Conservation (NPWC) Act, 2029 in Nepal. It is included in Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix III and also listed as endangered species in the International Union for Conservation of Nature (IUCN) Red Data Book. The Ministry of Forests and Environment (MoFE) has planned to prepare action plan of 20 protected species including Rhino, Tiger, Red panda and Snow leopard (MoFSC, 2014). In this regard, it is an effort to conserve this protected species by preparing the action plan as a guiding document to prescribe integrated and holistic approach focusing ground actions for long-term Wild Water Buffalo conservation. Similarly, the recently approved Koshi Tappu Wildlife Reserve (KTWR) Management Plan (2074/75-2078/79) has also emphasized to prepare Wild Water Buffalo Conservation Action Plan in order to address prevailing challenges and issues and maintain viable population in KTWR and Chitwan National Park (CNP).

1.2 Action Plan Development Process

A task force was formed comprising of experts from the Department of National Parks and Wildlife Conservation (DNPWC), Department of Forests and Soil Conservation (DoFSC) and major partner organizations; like National Trust for Nature Conservation (NTNC), World Wildlife Fund (WWF) Nepal, and Zoological Society of London (ZSL) Nepal. The main objective of the taskforce was to steer the action plan preparation process. The Terms of Reference was prepared to

guide necessary preparatory works for action plan formulation. The Table of Content of the action plan was developed, making it consistent with previous approved species action plan, and was shared among the experts of DNPWC and conservation experts. Review of relevant published and unpublished literatures and documents on Wild Water Buffalo conservation in Nepal was carried out. Further, to acquire fresh information with the conservation experts and community people through consultation, check list of questions was developed. With this checklist of questions, especially consultations with the former conservation officers of KTWR were undertaken. Similarly, consultations with the KTWR current staffs and community people in Buffer Zone (BZ) area at different clusters were conducted to solicit ground level information and suggestion to incorporate in the action plan. Based upon the literature review and consultations, a draft Wild Water Buffalo conservation action plan was prepared which was then shared at DNPWC. The comments and feedbacks were accommodated, and a refined action plan was prepared. This refined Wild Water Buffalo conservation action plan was forwarded to DNPWC for review to cross check the information and to improve the quality of the action plan. Thus, the final draft Wild Water Buffalo conservation action plan prepared and submitted for approval.

1.3 Scope of the Action Plan

The action plan is primarily guided by the Nepal National Biodiversity Strategy and Action Plan (2014 - 2020) and Protected Area (PA) management plans of Wild Water Buffalo bearing PAs of Nepal mainly KTWR and CNP. Information reported in this document is

based on the available literature and findings of recent studies on Wild Water Buffalo conservation. The action plan will be implemented to address the needs for long-term conservation of Wild Water Buffalo in Nepal. It considers collaborative efforts of a wide range of stakeholders including policy and decision makers, wildlife law enforcement agencies, conservation partners, academic institutions and communities for its successful implementation.

The action plan consists of seven chapters. First chapter is introduction, second chapter describes about national and international status and context

of Wild Water Buffalo conservation, third chapter highlights the conservation efforts and achievements of Wild Water Buffalo conservation in Nepal. Fourth chapter is about the conservation threats, challenges and opportunities of the species. The fifth chapter deals with the Wild Water Buffalo Conservation Action Plan 2020-2024. The plan is presented with goal, objectives, outputs and actions. The sixth chapter includes the budget and log frame whereas as chapter seven shows implementation mechanisms and monitoring of the action plan.



Background

2.1 Global Status and Distribution of Wild Water Buffalo

The Wild Water Buffalo is the ancestor of all domestic buffalo and represent a major reservoir of genetic material that could help safeguard and improve domestic buffaloes and their types throughout the world. The diverse species were widely distributed in

Europe and southern Asia in the Pleistocene period (Figure 1). It was restricted to Indian subcontinent and Southeast Asia as the climate became drier (Khatri *et al.*, 2012). Historically, wild populations of this specific species were distributed across south and south-east Asia from Mesopotamia to Indo-China (Mason, 1974; Cockrill, 1974). At present they are restricted to small pockets in scattered populations in Nepal, India, Bhutan

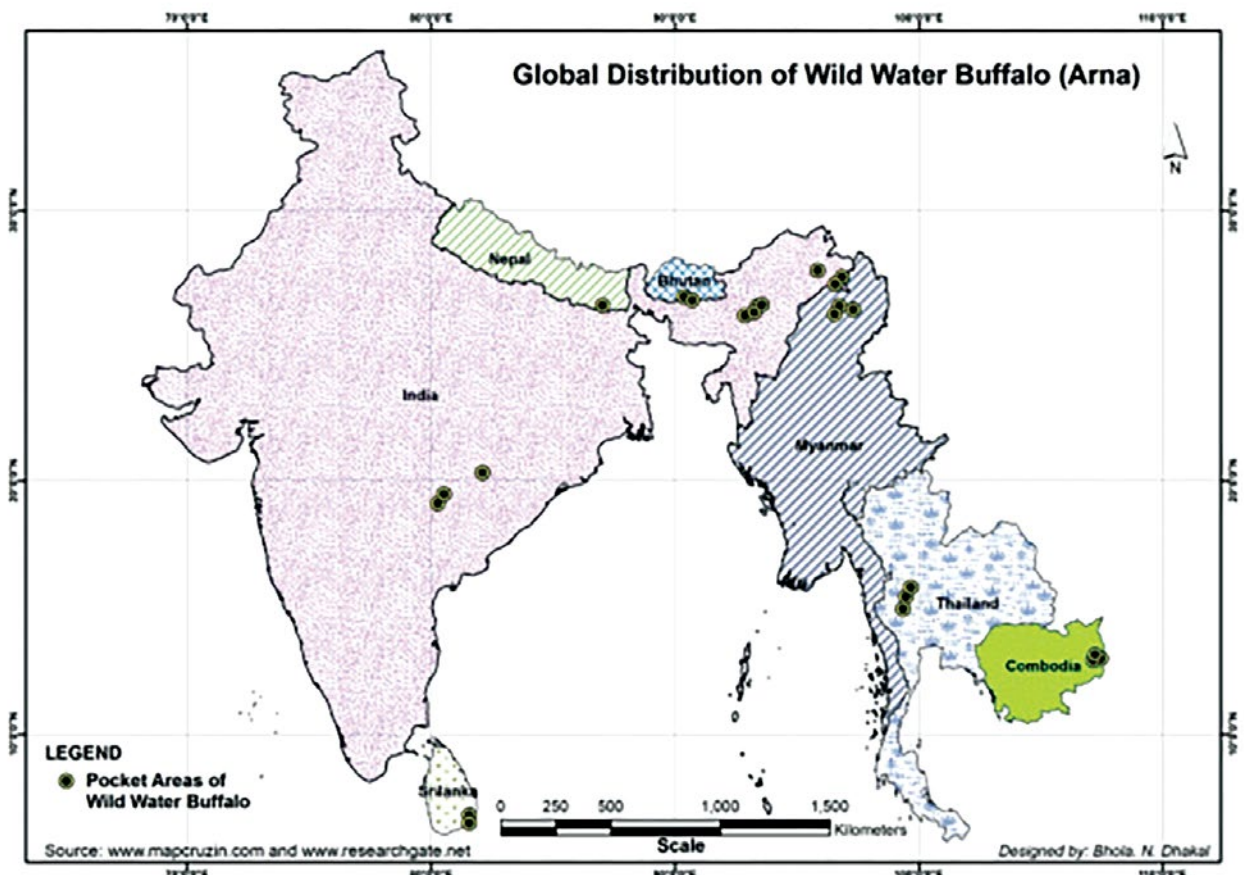


Figure 1: Global Distribution of Wild Water Buffalo

Myanmar (Aryal et al., 2011; Flamand et.al, 2003). The remnant population of western Thailand, Cambodia and Sri Lanka is thought to be debatable about their genetic integrity (Hedges, 1995; Muly, 2001) and feral populations exist in several other regions including Australia, Argentina and Arabian Peninsula.

The major populations of Asian Wild Water Buffalo are found at Kaziranga National Park in Assam and Indravati Wildlife Sanctuary in Madhya Pradesh in India (Saharia, 1982) but the species has been extirpated from large portions of its former range such as Pakistan, Bangladesh, Laos and Vietnam. At present, there are 3300-3400 population thriving in Wild Water Buffalo bearing countries (Hedges, 1995; Heinen & Srikosamatara, 1996; Hedges *et al.*, 2008).

2.2 Nepal's National Status of Wild Water Buffalo and its Distribution

Wild Water Buffalo population has been confined previously to the grasslands and swampy areas along

the Koshi River floodplain and surrounding areas of KTWR. The translocation of 15 Wild Water Buffaloes in old Padampur of CNP made the distribution of this species in two PAs of Nepal (Figure 2).

Dahmer (1978) carried out first census of Wild Water Buffalo just after the establishment of KTWR in 1976 and found sixty-three individuals. He also contrasted them with a feral herd of domestic origin that had presumably existed there since the mid to late 1950s. He also described two mixed (females and dependent calves) herds: the north herd and the south herd in broad distributional categories. It has been previously reported that female Wild Water Buffalo are thought to remain with their natal herds and show a high degree of philopatry (Heinen, 1993a). Subsequent studies (Heinen, 1993b; Heinen and Singh, 2004) relocated those herds and found that they were using similar home ranges to those mapped by Dahmer (1978). The females and calves counted in those two mixed herds were the only ones considered to be wild in those Koshi Tappu censuses.

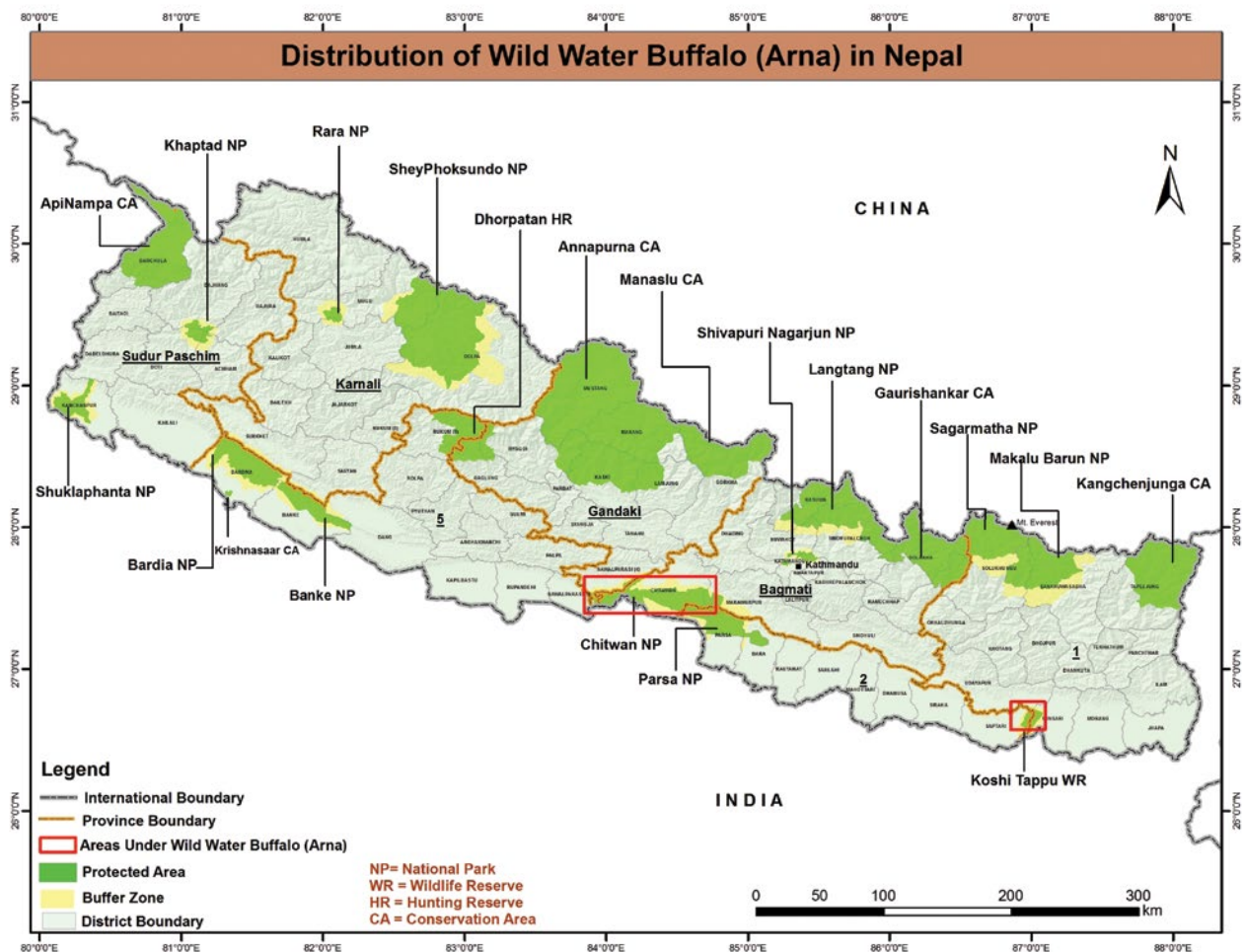


Figure 2: Distribution of Wild Water Buffalo in Nepal

There are lots of threats and challenges towards Wild Water Buffalo conservation and major threats entail population inbreeding; gene pool erosion with domestic buffalo; disease from domestic livestock and recurring floods (Heinen *et al.* 2015). In addition, occasional retaliatory poisoning and electrocution; competition for food and space among cattle, domestic and feral buffaloes are some anthropogenic factors that have led to the turmoil in its population (Chalise and Regmi 2018; Kandel *et al.*, 2014).

The population of Wild Water Buffalo is in the increasing trend since the establishment of KTWR in BS 2033 (1976) as its number increased from 63 to 441 in 2018 (Figure 3).

To establish alternate population of Wild Water Buffalo, fifteen Wild Water Buffaloes (twelve from KTWR and three from Central Zoo) were translocated at old Padampur of CNP in 2017. Out of this population,

five individuals died due to devastating flood that occurred in the monsoon of the same year right after four months of translocation. Right after the flood one tiger entered through the damaged enclosure and killed one Wild Water Buffalo. The field observation made in 2019 found twelve Wild Water Buffaloes (eight female and four male) in the enclosure.

2.3 Natural History

The Wild Water Buffalo, a large ungulate, is a herd loving mega-herbivores and falls in bovid family. It is believed to be domesticated 6000-7000 years ago in India and China. In 1758, Carl Linnaeus described the Wild Water Buffalo and gave the scientific name *Bos bubalis* to it. Robert Kerr changed this name to *Bos arnee* in 1792. In 2003, the name was again changed to *Bubalus arnee* by the International Commission on Zoological Nomenclature, a name that is currently accepted as valid.

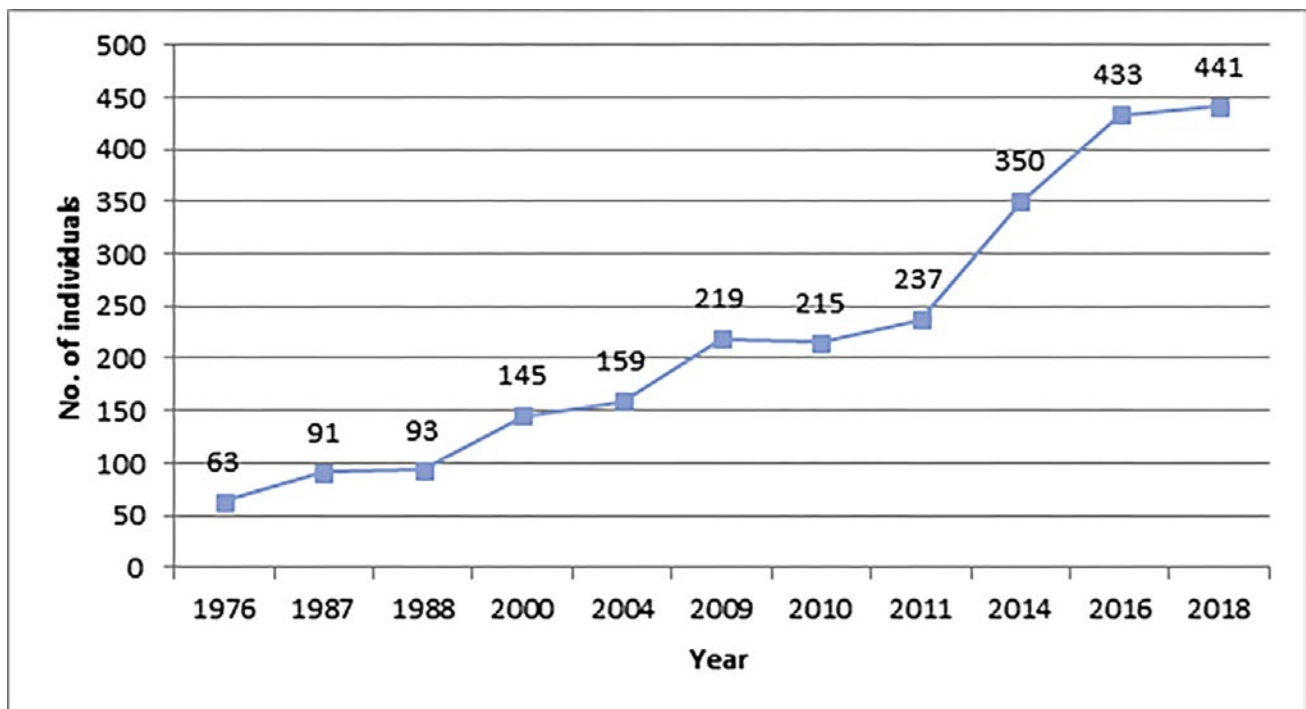


Figure 3: The Number of Wild Water Buffaloes Recorded During Different Censuses in KTWR

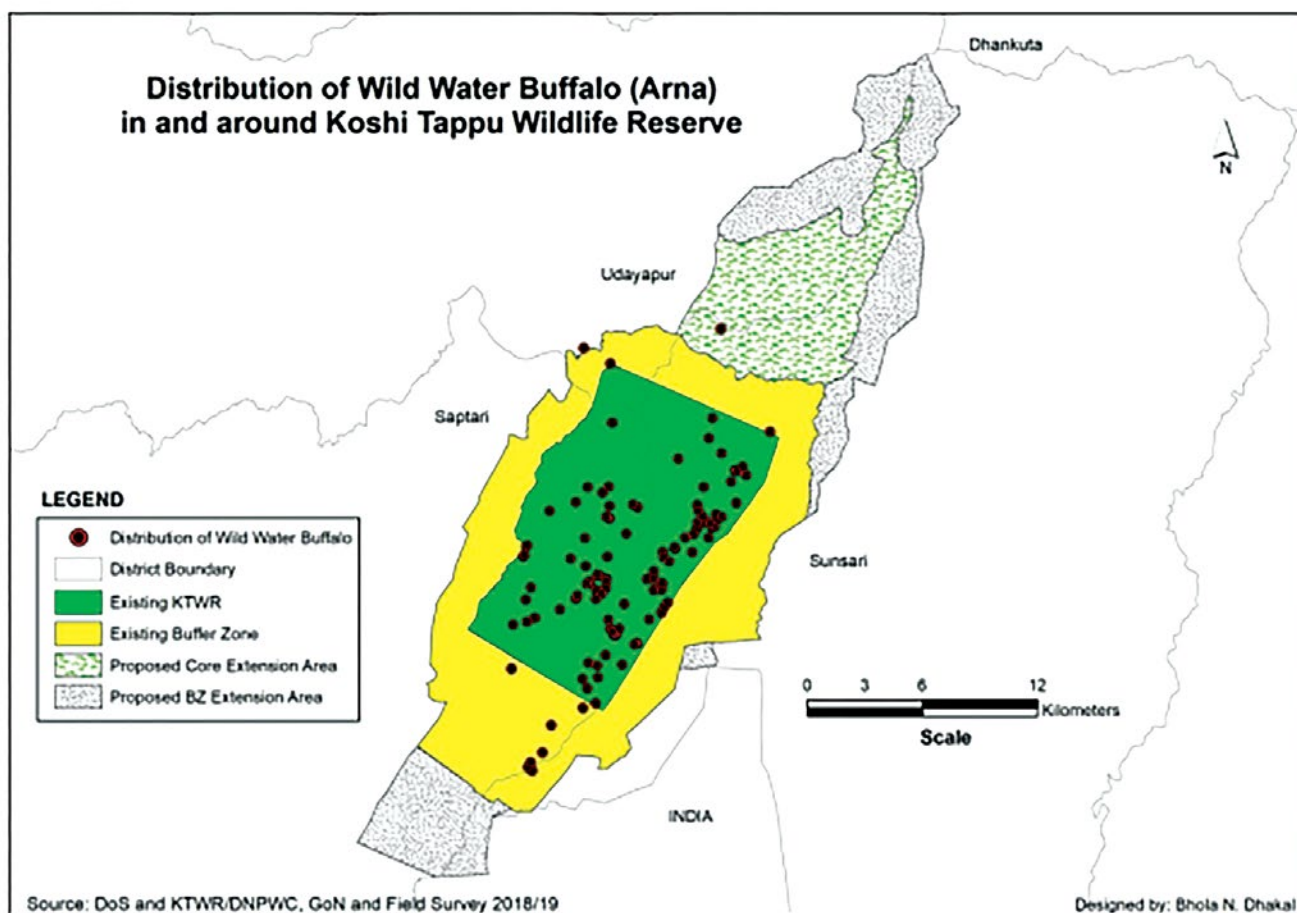


Figure 4: Distribution of Wild Water Buffalo at KTWR

Wild Water Buffaloes are broadly classified (MacGregor, 1941) into two types: river buffaloes and swamp buffaloes. Swamp buffaloes prefer swampy grasslands or marshlands and are distributed in south-east Asia extending northward to Yangtze valley in China. Whereas, river buffaloes had natural habitat of river valley and clean river water, hence, called as river buffaloes.

Asian Wild Water Buffalo falls under the mammalian species of order Artiodactyla, sub-order Ruminantia, family Bovidae, sub-family Bovinae, genus *Bubalus*, and species *arnee*. The wild type of buffaloes is larger than the domestic breed. They are massive with rather short, tuft legs. Males tend to be larger than females. Both sexes are slate-gray to black in color, although mature individuals are black. The legs below the knee are pale. One or two chevron mark or white crescents are usually present on the throat or upper chest and eyes also have pale markings on the side of the nose and by mouth. The Wild Water Buffalo are known for their large or scimitar-shaped horns, which may exceed 120 cm. These are almost semi-circular

in shape in the water buffaloes of Koshi Tappu and Indian population while in buffaloes from Cambodia and Thailand, the horns spread much more to the side with inward curvature. Horns of males are thicker than females. Wild Water Buffalo is readily differentiated from domestic buffalo by their long scimitar-shaped horns. Horns in domestic buffaloes have different shapes, they often have tight curl; if scimitar shaped, they rarely reach the size of Wild Water Buffalo (Chalise, 2016).

2.4 Ecology

The Wild Water Buffalo profoundly prefers water-logged areas mainly along the riverine flood plain habitats (Kandel *et al.*, 2014) as they are wallowing frequently for their biological and ecological needs. They are found in open grasslands, alluvial plains, and marshes, although they may use woodlands for shelter during heat stress or heavy rainfalls. KTWR, which is located in south-eastern Terai region of Nepal, is considered as suitable area for Wild Water

Buffalo population (Heinen, 2002) due to most preferred swampy territories along the Koshi River and the abundant grassland. Small patches of Khair (*Acacia catechu*)- Sissoo (*Dalbergia sissoo*) forest and deciduous mixed riverine forest also serves as important habitat for other wildlife (Sah, 1997) such as Spotted deer (*Axis axis*), Barking deer (*Muntiacus muntjack*), Hog deer (*Hyelaphus porcinus*), Wild boar (*Sus scrofa*), Blue bull (*Boselaphus tragocamelus*) and Asian wild elephant (*Elephas maximus*). A newly migrated small herd of Asian wild elephant have also been sharing these habitats for the last five years (Kandel et.al, 2018).

They are probably grazers by preference and graze in mornings and evenings, feeding mainly on grasses when available, but they also eat herbs, fruits, and bark as well as browse trees and shrubs. Several evidences in Nepal and India show that they feed on crops, including rice, sugarcane and jute (Heinen and Kandel 2006; Aryal et. al., 2011). Shrestha et.al (2017) identified Cattail (*Typha elephantine*), Kans (*Saccharum spontaneum*), Jhauwa (*Tamarix dioica*) and Narkat (*Phragmites karka*) as the key plant species preferred by Wild Water Buffalo. They are usually found beating the mid-day heat by lying in the shade or wallowing in muddy pools. They like to submerge themselves up to their nostrils. This not only helps them cooling off but also helps to get rid of skin parasites and offers relief from insect-bites. The sweeping horns are often used as shovels to increase mud coverage.

The Asian Wild Water Buffalo has length of 2.4-3 m (7.8'-9.8') and weigh 800-1,200 kg (1,800-2,600 lbs). A male attains maturity at the age of 4 years, but female attains puberty after the age of 3 years. A female is capable of regular production up to age of 15 years. Gestation period may last up to 300 to 340

days or 10 -11 months. A mother can give birth to one calf at once but sometimes twin is also possible. At birth, the calves are buff-brown in color. They begin to darken around six months of age. The calf is nursed by mother for 6-9 months. The breeding season is common within May – June (Chalise 2008). It has been recorded that the maximum age of Wild Water Buffalo is 25 years in wild and may reach up to 29 years in captivity (Nowak 1999). As a social animal, a bachelor male herd may be around of 10 individuals. A herd of female is led by only one dominant male. Around 15-20 individuals may mix together during mating period which is common in KTWR, Nepal (Chalise 2008).

Little is known about the behavior of Wild Water Buffalo. The activity time budget such as grazing, moving, resting, wallowing and other activities have a significant implication on knowing the ecology of the animals and necessitate its management for Wild Water Buffalo conservation (Kandel et al. 2019). Their activity pattern might be both diurnal and nocturnal (Chalise and Rai 2014). But peak feeding activity occurs in the late afternoon and dusk followed by dawn. The day is often spent in either forests or water pools. Wallowing in mud is frequent, especially in summer to protect them from both insect-bite- and heat stress due to direct sunlight. They show seasonal movement within KTWR, however, they have stable home ranges. They are social animal and live in a herd of generally 10-20 females with calves and supplemented by one or two males. The male buffalo is extremely protective of their herd and females form a protective layer in front of the calves when threatened. Bachelor males of 8-10 individuals live together while adult males are solitary; and flee into tall grass or forest when threat persists.



Conservation Efforts and Achievements

3.1 National Conservation Policy

The Asian Wild Water Buffalo is listed as 'endangered' in the IUCN Red Data Book, and as an Appendix III species in CITES, prohibiting international trade of the species. The species is included in the protected mammals list under the NPWC Act, 2029 (1973). Nepal National Biodiversity Strategy and Action Plan (NBSAP) 2014-2020 emphasize priority actions in conserving endangered species including Wild Water Buffalo. Nepal has strong legal provisions to control wildlife crimes particularly for protected mammals. The NPWC Act, 2029 provisions 'a fine ranging from NPR 100,000 to NPR 500,000 or an imprisonment ranging from one year to ten years, or both,' for offenders and accomplices convicted for poaching of Wild Water Buffalo. The act also has provision to reward informants with an amount up to NPR 25,000 for aiding in seizure or arrest of wildlife criminals related to Wild Water Buffalo poaching.

The Government has initiated a relief scheme to help victims affected by wild animals listed in the Wildlife Damage Relief Guideline, 2069 B.S. (amendment 2072). In addition, community-based relief funds and special livelihood package programs to victims have already been initiated at the PA level. Effective law enforcement is crucial to control poaching and illegal trade of wildlife including Wild Water Buffalo. National Wildlife Crime Control Coordination Committee (NWCCCC), and Wildlife Crime Control Bureau (WCCB) and its respective district units are initiated to tackle illegal wildlife trade and poaching of endangered species including Wild Water Buffalo. There are 26 WCCBs units comprising a wide range of concerned authorities covering 28 districts to effectively mobilize available expertise and resources to combat wildlife

crime in the country. To fight against organized illegal wildlife trade at regional level, the South-Asia Wildlife Enforcement Network (SAWEN), with its secretariat in Nepal, was established in 2011. SAWEN takes concerted and coordinated actions in eight South Asian countries for wildlife related law enforcement.

3.2 Conservation Efforts

Koshi Tappu is formed as a result of braiding and meandering of the Sapta Koshi River. This river is a convergence of seven perennial river systems namely Arun, Tamor, Likhu, Sunkoshi, Dudhkoshi, Tamakoshi and Indrawati. This is the largest perennial river system in Nepal with a catchment area of 60,000 Km². The Sapta Koshi River after flowing about 60 km from Tribeni at Chatara enters to Birpur at Indian border of Bihar State.

The Koshi barrage was constructed at Nepal, close to India border, by the Indian Government under an agreement with Nepal Government for the purpose of flood control, irrigation water supply, and hydropower development. The earthen embankment construction on both sides of the river was initiated in 1954. The late King Mahendra had laid foundation stone of the barrage in the presence of the then Indian Prime Minister Jawahar Lal Nehru in 1958 and inaugurated the barrage after completion in 1965 in presence of the then Indian Prime Minister Lal Bahadur Shastri (KTWR, 2018).

The history of KTWR can be ascribed to the establishment of the Koshi barrage. Soon afterwards, Government of Nepal (GoN) established six Royal Hunting Reserves in the Terai, including Koshi Tappu in 1969. The Koshi Tappu was covered with dense

riverine forest and tall grasses that harboured diversity of animal species, including the Bengal tiger (*Panthera tigris tigris*), leopard (*Panthera pardus*), Asiatic wild elephant (*Elephas maximus*), Wild Water Buffalo (*Bubalus arnee*), Nilgai (*Boselaphus tragocamelus*), Dolphin (*Platinista gangetica*) and Swamp partridge (*Houbaropsis bengalensis*). The construction of Koshi dam, Koshi bridge, access road, railway line coupled with other anthropogenic activities and natural calamities have cleared the forest and eventually destroyed habitat of big wild mammals. As a result, it has lost 80 % carnivores and 58 % ungulates over the last 40 years (Heinen, 1993a).

In Nepal, biodiversity conservation took momentum only after the establishment of the National Parks and Wildlife Conservation Office in 1972 and the subsequent promulgation of the NPWC Act, 2029 (1973). The diminishing faunal and floral diversity drew attention of GoN to establish a PA on the land already acquired by the Koshi Embankment Project. GoN established KTWR in 1976 with the objective of conserving last remaining population of Wild water buffalo with an area of 65 Km². To strengthen protection efforts, Nepal Army (NA) was deployed in 1977 for strict law enforcement. It was extended to 175 Km² in 1978 covering part of Sunsari, Saptari and Udayapur districts. The status of Wild water buffalo was first studied by Dahmer in 1978 and carried out census and documented 63 individuals. Since then, Wild Water Buffalo census has been carried out on regular basis in every five years. In 1979, the GoN relocated around 12,000 people from KTWR, who were living inside the reserve, outside of the core area by providing them land elsewhere (DNPWC, 2014).

The year 1980 marked greater commitment of GoN towards wildlife conservation by the establishment of a separate department called Department of National Parks and Wildlife Conservation (DNPWC). Since then, many studies on wildlife were carried out such as fishes, waterfowls, Wild Water Buffalo, elephant, etc. The KTWR was declared as a wetland of international importance, Ramsar site, on December 17, 1987 with greater commitment for conservation when Nepal joined the "Convention on Wetland of International Importance especially as Waterfowl Habitat" (IUCN 1990). In the year 1994, DNPWC prepared biodiversity database of KTWR and its adjacent area with the joint support of Woodlands Mountain Institute/IUCN Nepal. In the same year DNPWC initiated Park People Program (PPP) for BZ development with the support of United National Development Program (UNDP). The DNPWC initiated formulation of conservation strategy

and integrated management planning of KTWR and its vicinity in 1998.

In 2002, the Park and People Program was replaced by another UNDP supported Participatory Conservation Program (PCP) with an objective to involve BZ institutions in biodiversity conservation by enhancing the capacity of its members. The BZ of KTWR was declared in 2004 with the area of 173 Km².

KTWR adopted Community Intensive Program to reduce land use complex and conserve biodiversity in Nepal with the support of IUCN/World Bank in 2004 and 2005 which also included providing semen of Wild Water Buffalo to improve the breed of local buffalo through artificial insemination. With the three years of project implementation, it was found that local people showed more interest towards the semen of Murrah buffalo and improved bull.

Similarly, with the financial support of UK government's Darwin Initiative for the Survival of Species, Bird Conservation Nepal (BCN) and Wildfowl and Wetland Trust (WWT) worked to develop alternatives for income generation for wetland dependent community around KTWR from 2006-2009 (Thapa & Dahal, 2009).

In August 2008 the south-east portion of BZ was swept away by the devastating flood in Koshi River (Khatri *et al.* 2011). The flood completely destroyed, the then three wards of west Kushaaha, 4 wards of Shreepur and 5 wards of Haripur Village Development Committees (VDCs). Remaining six wards of west Kushaha and 5 wards of Laukhai VDCs were inundated in the Koshi flood. This devastating flood damaged the entire south-eastern portion of BZ and reserve area including some human casualties.

With financial assistance of UNDP/Global Environment Facility (GEF) 'Conservation and Sustainable Use of Wetlands in Nepal (CSUWN)' project was implemented for five years from January 2008 to 2013 with an overarching goal to ensure maintenance and enhancement of wetland biodiversity and providing environmental goods and services to improve local livelihood. The program aimed to minimize pressure of the local people in the reserve by providing alternative livelihood opportunities.

National Trust for Nature Conservation (NTNC) is continuing to implement "Strengthening Koshi Tappu Wildlife Reserve for the effective management of its Biodiversity" project since September 18, 2015 and

the project is still supporting KTWR. Similarly, Koshi to Kanchanjunga Project is also under the implementation from 2019 with the main objective of conserving the biodiversity of Koshi to Kanchanjunga region.

The first management plan of KTWR (2009-2013) was developed in 2009 to safeguard Wild Water Buffalo species and restore its habitat and secure removal of existing intrusion. Similarly, the management plan for the KTWR (2018-2022) has been revised and is under implementation.

3.3 Translocation of Wild Water Buffaloes

KTWR is subject to extreme flooding during the monsoon; buffalo and other ungulates frequently leave at that time and seek refuge in croplands and flood-related mortality is a problem for the population (Heinen, 1993). There is little natural forest in the BZ of KTWR that can act as a flood refuge (Heinen and Poudel 2015). Heinen (2001) suggested Chitwan and Bardia for the possible translocation sites as both have the advantage of much larger land areas, extensive riverine habitats adjacent to upland forests which could provide flood refugia, and better protection.

After three decades of recommendations by various experts, translocation of Wild Water Buffalo from KTWR to CNP took place from January 27 - February 7, 2017 with support from United States Agency for International Development (USAID)'s Hariyo Ban Program through WWF Nepal. Thus, thirteen Wild Water Buffaloes (10 F and 3 M) from KTWR and three (2 F and 1 M) from Central Zoo were captured for translocation to CNP for establishing alternate population, where they were reported to occur until early 1960 (Spillet & Tamang 1966; Seidensticker 1975) and to protect Wild Water Buffalo from possible threats and challenges perceived and also from yearly Koshi flood that can sweep-out some population. Among thirteen captured Wild Water Buffalo from KTWR, twelve individuals (10 F and 2 M) were translocated to CNP and one (1 M) was taken to Central Zoo from KTWR. In total 15 Wild Water Buffaloes were kept in an enclosure of 30 ha. in Padampur area of CNP and protected by solar fence. Similarly, a 400 m water canal was also constructed for water supply arising from Churia. The devastating flood of 2017 killed five Wild Water Buffaloes which included all three individuals brought from Central Zoo and two from KTWR. The devastating flood also damaged the enclosure and made one opening

through which a tiger entered and killed one Wild Water Buffalo leaving only nine individuals. There are 13 Wild Water Buffaloes (8 F and 5 M), including four calves as of June 2020.

The Wild Water Buffaloes in the enclosure have been monitored jointly by the staffs of CNP and NTNC to know the condition of translocated Wild Water Buffaloes on a daily basis. The Wild Water Buffalo looked lean and thin in the initial period probably due to the new environment and inadequate water. After few months of translocation, flood further degraded the grassland making the situation of these Wild Water Buffalo from bad to worse. The supplement food was then provided to the Wild Water Buffaloes especially during the season when grasses were not adequate. During the dry season it is observed that stream arising from Churia is dried and there is acute shortage of water in the enclosure. It is utmost urgent to clean the source of this stream in the Churia hill to provide sufficient water and to install solar pump to provide adequate water to the Wild Water Buffalo.

Before the release of this Wild Water Buffalo in the wild, the herd size should be increased, and the enclosure should be expanded. If they have to release in the wild sufficient number should be added in the herd to fight with their predator mainly tiger. Similarly, translocation of Wild Water Buffalo in BNP could be done after release of Wild Water Buffalo from enclosure at CNP and their survival in the wild.

3.4 Expansion of KTWR

There is an opportunity of extending the habitat of Wild Water Buffalo in the northern and southern part of the reserve. The extension will also support to persuade the illegal settlers at north and south that would contribute to control the illegal livestock grazing in the reserve. With the extension, there will be continuity of aquatic and terrestrial habitats towards north-west that provides ample space for Wild Water Buffalo, Wild elephant and many other wild animals. This will also create likelihood of seasonal migratory habitat for the existing Gaur.

The committee to study the extension of KTWR formed by DNPWC submitted the Reserve Extension Report on February 20, 2015. The committee proposed to extend northern boundary up to Chatara Bridge and in the south up to Koshi Barrage and final area of KTWR and its BZ will reach to 319 Km² and 205.6 Km² respectively. The extension of this area has been a strategic action to conserve this endangered species.

3.5 Community Involvement

The BZ program is a major strategy to protect the core area of the reserve through community-based natural resource management in its periphery. The NPWC Act, 2029, Buffer Zone Management Regulations, 1996 and Buffer zone Management Guidelines, 1999 provide policy and legal framework for BZ management in Nepal. These legislations pave way for the supply of forest products to the local people along with community development, income generation and conservation awareness program to solicit participatory conservation minimizing human wildlife conflicts

In KTWR, an area of 173 sq. km covering part of Sunsari, Saptari and Udaypur districts has been declared as the BZ in 2004. Presently, BZ covers 4 municipalities and 1 rural municipality. There are 469 Buffer Zone User Groups (BZUGs), nine Buffer Zone User Committees (BZUCs) and one BZMC for planning and implementation of BZ program. The BZ institutions implement the BZ program with the support of KTWR and conservation partners. These institutions play important role as a bridge between reserve and local people. They also provide instant relief fund upon human casualty by wildlife.



Threats, Challenges, and Issues

4.1 Threats

4.1.1 Flooding

The construction of Koshi barrage, with earthen embankment or dyke on both sides of the river was completed in 1965. With the onset of monsoon, every year, the discharge of water rises in the river and there is always possibility of flood. The highest flow or discharge rate of 913,000 cusec was recorded on August 5, 1968 at Sapta Koshi River at Barahakshetra over 45 years (between 1945 and 2016), while the least flow of 191,418 cusec was recorded on July 30, 1953 (KTWR, 2018). The records over 71-year period show a pattern of flow rate with peaks followed by diminished flow over a 2-5 years' period and a 14-16 years' flood cycle. Similarly, it has been observed that river course is changing due to deposition of large volume of silt and sedimentation. The river was in the western side in 1980 and it changed to eastern side close to the dyke in 1996 (Figure 5). The spurs are also being constructed in the eastern side of the dyke to channelize the river in the middle part and to safeguard the dyke as well. The last devastating flood occurred in 2008 broke the eastern embankment submerging south-eastern portion of BZ and reserve area with few human casualties. However, the river course has slightly shifted to the centre from its previous course in 2016 (KTWR, 2018).

Different studies also show that the Wild Water Buffaloes have mostly died due to the monsoon floods. Heinen, (1993b), conducted Wild Water Buffalo census for two consecutive years in 1987 and 1988. He found that out of 16 calves only 8 survived from the monsoon flood of 1987 and several adult females were drowned (Heinen, 1993b). Similarly,

the continuous flood during every monsoon has been submerging the grassland and tree cover thereby reducing potential habitat to barren/degraded land inside the reserve.

4.1.2 Genetic Erosion

Muly (2001) and Heinen (1993) reported that local livestock owners in Assam, India and KTWR encouraged cross breeding because hybrid male calves brought higher prices in local markets and are used as draft animals. There is thus reason to suspect that crossbreeding between wild and domestic buffalo has been ongoing for millennia given how common domestic buffalo are in tropical and subtropical Asia and how widespread the wild species was until the human population explosion of the 20th Century. Flamand et al. (2003) confirmed that there were three genetically identifiable populations of buffalo in the reserve: wild, domestic and backcrossed. It is very difficult to distinguish wild domesticated and backcrossed, thus making their actual conservation status uncertain. Some scientists suspect that there may not be the pure Wild Water Buffalo remaining since interbreeding with feral and domestic buffaloes are so widespread. Thus, interactions between domesticated buffalo and Wild Water Buffalo can cause dilution of wild population and thus poses multiple threats to the existence of Wild Water Buffalo population in the reserve.

4.1.3 Risk of Disease Transmission

There is high probability of intermixing wild, feral and domestic buffaloes resulting to disease transmission while sharing the grassland forest and wetlands. The disease such as Foot and Mouth Disease (FMD) and Rinderpest has already been seen in few buffaloes.

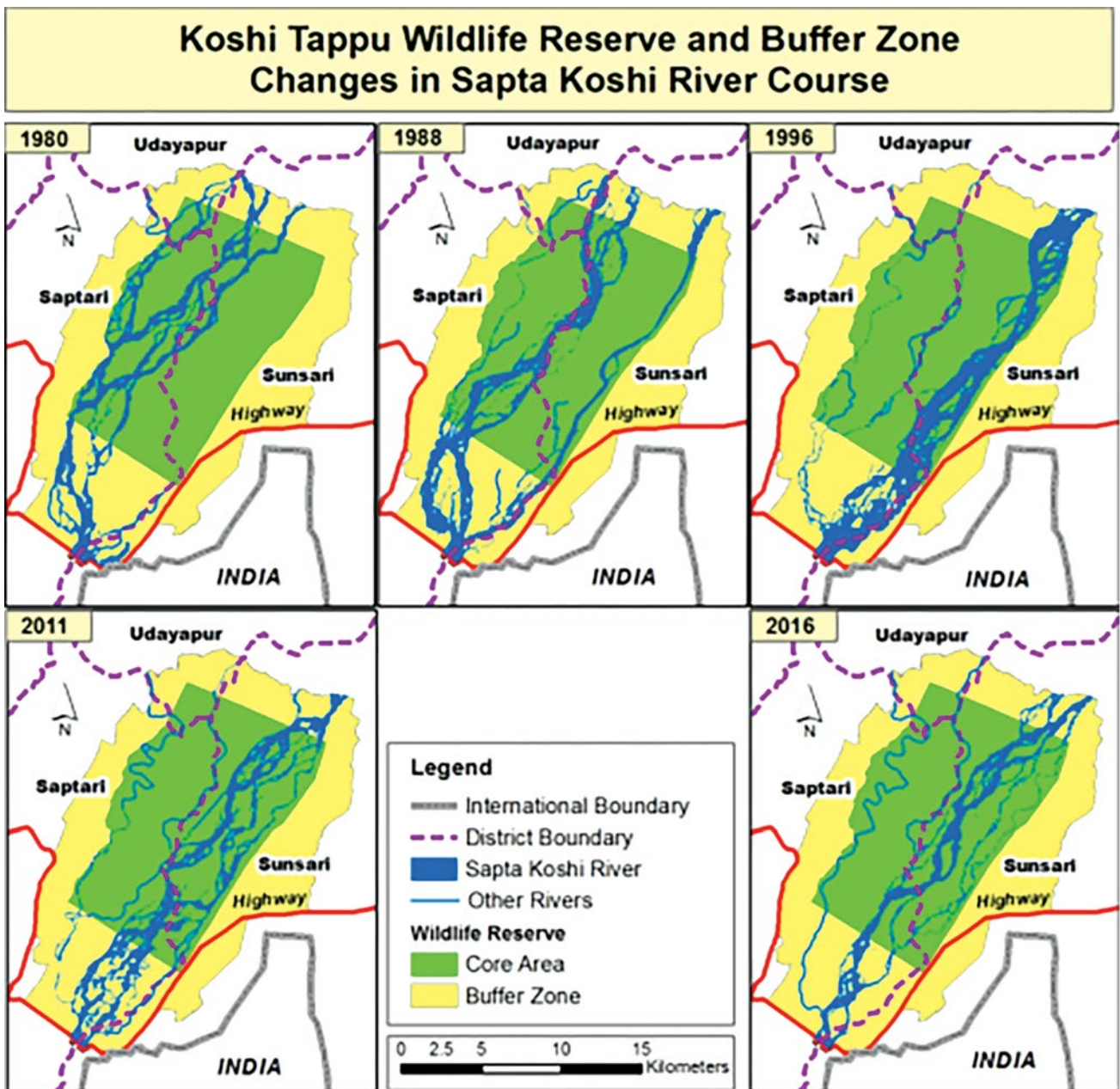


Figure 5: Koshi River Course in Different Years

4.2 Challenges

4.2.1 Feral Cattle and Illegal Livestock Grazing

Local people used to graze their livestock in the islands of Koshi river flood plain for time immemorial. After the declaration of the reserve, those cattle and buffaloes remained there and became feral for generations. Heinen (2008) reported that villagers used to bring large numbers of tended cattle and buffalo inside the reserve. Many of these domestic animals were kept in semi wild or tended, free ranging state to crossbreed with wild males in

expectation that hybrid calves would in return give them higher price (Heinen, 1993). Every day, around thousands of livestock has been brought for grazing in the adjoining BZ of southern and northern part of the reserve (DNPWC 2014).

Cattle and buffaloes grazing inside reserve cause habitat degradation, scarcity of forage for wildlife, likely transmission of diseases from livestock to wildlife, genetic erosion of Wild Water Buffaloes because of crossbreeding with domestic buffaloes (Aryal et al., 2011; Heinen & Paudel, 2015). The

continued practice of illegal grazing by the livestock and unclaimed feral cattle belonging have made the management difficult. It is also reported that people from across the border regularly bring livestock and feral cattle for grazing in KTWR. Thus, efforts to control illegal grazing by capture and fine have been proved ineffective.

To control illegal grazing, in 2001, Reserve authority, with permission from the DNPWC, began culling buffalo of domestic origin. By March 2004, 167 buffaloes had been culled inside the Reserve (Reserve records, 2005) to reduce their population as a message to stop grazing animals illegally. However, this policy was controversial, and culling was stopped. Instead an order was posted to remove all domestic cattle from the Reserve in 2004. In the case of feral cattle due to its sacred status, management of feral cattle have been a great challenge for the reserve authority.

Feral cattle evacuation program was first initiated in 2004-2005 by KTWR and again in 2010 with the support of CSUWN by implementing sweeping operation which was undertaken jointly by reserve staffs, Nepal Army and BZ communities. The joint initiative became effective for one full year as census carried out right after showed that there were only eighteen feral buffalo, four hundred fifty-five feral cattle, 410 domesticated buffalo and one thousand six hundred thirty cows (Ram, 2016). Adequate number of reserve posts including Nepal Army and support from political parties will help control illegal grazing and successful management of the reserve.

The NPWC Act, 2029 and other legislations related to wildlife conservation do not allow auction of these livestock. However, Local Government has authority to auction these livestock with certain process. A short-term and a long-term strategy have to be developed to evacuate feral buffalo and feral cattle. In the short-term plan, regular sweeping operations have to be undertaken. Similarly, castration of male livestock will also work as short-term plan to reduce the number and discourage the objective of collecting calves. Long term plan includes establishment of three large Kanji house inside the reserve and nearby BZ. The Local Government can sell these livestock through auction as per the prevailing law. If the Local Government does not go for auction, the livestock will be kept in Kanji house. After the death of livestock, they will be buried inside the core area. These short-term and long-term plans require regular budget of KTWR and the support of BZ community and political parties.

4.2.2 Encroachment

GoN designated KTWR in 1976 for which private land was also acquired providing alternate land outside of PA. After receiving compensation and alternate land many households (HHs) left their land. However, there are still 170 HHs encroaching 105 bighas of land especially in Saptari district (between Badgama post and Pathari Sector office) who claimed that they have not received the allotted land and the case is in the Supreme Court, as a result they are still occupying the land in the core area. The 19th land acquisition settlement committees submitted detailed report but and the issue has not been resolved. Similarly, there are also encroachers or illegal settlers from several districts occupying the public land in northern side of the reserve as Koshi River flood victims hoping to get compensation or land entitlement in the future. In addition to these disputes. boundary of core and BZ in Saptari district has yet to be demarcated and therefore affecting adversely to control infringement. This encroachment in corridor and flood plain has therefore been a great challenge. In addition to this, encroachment problem has also discouraged the reserve extension program as well.

4.2.3 Unsustainable Harvesting of Forest Products

There are very few Buffer Zone Community Forests (BZCFs) in Saptari and Sunsari district and the area of the BZCF is small to meet the needs of forest products for its beneficiaries. The reserve authority allows collection of forest products such as grass for thatching, fodder for cattle and fuel wood for domestic use, which is legally allowed in seasonal basis (KTWR, 2018). However, the pressure of local community is so high that they enter reserve illegally to collect grass, and other forest products (Heinen and Kandel, 2008). Local people use *Saccharum spontaneum*, *Typha elephantine*, and *Phragmites karka* for thatching (Heinen, 1993b). Similarly, *Chrysopogon aciculatus*, *Cynodon dactylon*, *Tamarix dioica*, and *Eleusine indica* are preferred grasses for livestock. Uncontrolled and over harvesting of plants from the reserve reduces the quantity and quality of plants that are preferred by Wild Water Buffalo (Aryal, 2011).

4.2.4 Invasive Species

Invasive species such as *Chromolaena odorata*, *Eupatorium adenophorum*, *Lantana camara*, *Mikania micrantha* are found in KTWR (Siwakoti, 2009; Chalise 2018) which are becoming problematic for the management (Chettri et al., 2013). Mikania is an

extremely serious weed with an exceptionally fast-growing capacity (Choudhary, 1972) that damages or kills other plants by preventing light and smothering them. It also competes for water and nutrients, but perhaps even more importantly, it releases substances that inhibit the growth of other plants (Ye and Xia, 2001). It is understandable that local perceived challenges from all types of invasive plants in the KTWR.

4.2.5 Forest Fire

Illegal entrance of local farmers to the reserve for collection of forest products has increased the likelihood of fire incidence in the grassland. Due to uncontrolled forest fire composition of the forest structure has changed resulting replacement of preferred species by less preferred ones. Most of indigenous plant species are more sensitive to forest fire and takes time to grow back (Aryal et al., 2011).

4.2.6 Shrinking Habitat

The nature of changing the river course and flash floods during rainy season inundates the grassland habitat thereby creating negative impact on grasslands. Thus, the habitat of the Wild Water Buffaloes is shrinking every year. The shrinkage in the habitat has impacted on the quantity and quality of available food for Wild Water Buffalo (Aryal et al., 2011).

4.3 Issues

4.3.1 Regulation of Forest Resources

KTWR has 15 BZCFs with a total area of less than 2 sq. km. The demand of fuel wood, fodder and grass from these BZCF is very high and most of the area of BZCF is very small and therefore it is very difficult to meet the demand of the local people. Driftwood brought by Koshi River flood is one of the major forest products

and distribution of driftwood also becomes difficult for the reserve authority.

4.3.2 Conversion of Grassland into Woodland

In the eastern stretch of KTWR, it was observed that the grassland has changed into forest due to natural succession. This natural phenomenon has further shrunk the grassland habitat and pushing the wildlife to enter into the BZ through Shreepur and Haripur area as there is no solar fence for crops.

4.3.3 Repair and Maintenance of Solar Fence

Solar fence was erected across the eastern stretch from Prakashpur to Kushaha to stop the entry of mega wildlife mainly Wild Water Buffaloes and Wild elephant. The fencing has been proved beneficial to reduce the conflict. However, repair and maintenance has been a pressing issue in the long run. It is observed that Wild elephant damages the fence, and this allows wildlife to enter the BZ for crop depredation. Sometime, local people cut the wire intentionally to enter into the reserve and collect fuel wood and other resources. This required regular maintenance of solar fence which also help to reduce conflict between human and wildlife increases.

4.4 Opportunities

The NPWC Act, 2029 has placed Wild Water Buffalo under schedule I as protected wildlife highlighting the need for urgent conservation actions. Despite receiving inadequate priority in the past, nowadays, this species is getting attention at national level. The Wild Water Buffalo population of KTWR can serve as source population of Nepal and it can also be translocated to Bardia National Park (BNP) as well after the successful translocation of thirteen Wild Water Buffalo to CNP in 2017. However, feasibility study has to be conducted prior to the translocation.

Wild Water Buffalo Conservation Action Plan

5.1 Goal

Conserve viable population with improved habitat thereby maintaining genetic integrity of Wild Water Buffalo in harmony with local people.

5.2 Objectives

Altogether five objectives are set to achieve the Goal which are mentioned below with Rationale, Output and Actions.

5.2.1 Objective 1

Improve and expand the habitat of KTWR to provide adequate forage and wallowing sites to ensure the viability and ecological functionality of Wild Water Buffalo population.

Rationale

Habitat degradation is caused mainly due to submerging of grasslands, drying up of wetlands, invasion by invasive alien plant species in prime habitats, and natural succession and their pressures on grasslands. The habitat favorable for the Wild Water Buffalo gets submerged by the monsoon flood and degrades the grassland every year. With the advent of autumn season, the grassland slowly stabilizes, and thousands of livestock are brought illegally into the core area for grazing. This illegal grazing not only rises the competition, but also degrades the grasslands due to over grazing. This over grazing gives rise to invasive species which has degraded grassland habitats every year. Similarly, natural succession has also become one of the factors of habitat degradation as preferred grassland habitat is decreasing due to conversion into woodlands.

Koshi Project has been working on mechanical sand dredging with the aim of channelizing the river to control the flood and contain them between the eastern and western dykes. The shifting of river course has affected the recharge of water in the wetlands. Thus, it has affected the shortage of water in the eastern stretch especially in the Prakashpur and Madhuvan area. As a result, it is observed that there is shortage of water for northern large herds of Wild Water Buffalo.

Output

- ▶ Critical grasslands and wetlands identified and mapped;
- ▶ Critical wetlands restored with appropriate conservation interventions;
- ▶ Invasive species controlled in both grassland and wetlands;
- ▶ Grassland managed and improved for quality forage for Wild Water Buffalo;
- ▶ A common consensus for the expansion of Wild Water Buffalo habitat reached at local, regional, provincial and national level;
- ▶ Expansion of the Wild Water Buffalo habitat initiated.

Action

- ▶ Conduct mapping of all critical habitats (grasslands and wetlands) and assess their successional dynamics to develop management prescriptions;
- ▶ Study preferred grass species for Wild Water

Buffalo and carry out plantation;

- ▶ Carry out grassland management by manual cutting, uprooting and/or controlled burning;
- ▶ Restore important wallowing spots by improving the water supply;
- ▶ Install solar water pump to provide water in the water deficient wetlands;
- ▶ Undertake inventory and mapping of invasive species;
- ▶ Control invasive species by uprooting, drying and burning;
- ▶ Organize dialogues with Koshi Project personnel on a regular basis about the maintenance of wetlands caused by sand dredging in channelizing the river course;
- ▶ Construct water holes at extended habitat;
- ▶ Conduct dialogue with local community and political parties about the reserve extension report;
- ▶ Organize learning visit of BZ institutions and key stakeholders including representative of political parties to witness conservation of protected species in the extended PA;
- ▶ Support media correspondent to visit other extended PA and publish article with respect to KTWR;
- ▶ Provide compensation for the registered land;
- ▶ Provide skill development training to the illegal settlers and encroachers;
- ▶ Demarcate the extended area.

5.2.2 Objective 2

Conserve Wild Water Buffalo population by prohibiting illegal grazing of domestic buffalo and cattle to control competition, disease transmission, genetic introgression and releasing the translocated population in wild.

Rationale

Every day, thousands of livestock are brought illegally for grazing in the core area. Local people also leave their domestic buffalo and cattle in the core area for grazing. It is believed that they recognize their cattle and come to the reserve regularly to look and pick up the calf. Reserve authority regularly capture these livestock and keep in Kanji house and publish notices

for returning them by paying certain fine. These livestock become feral/semi wild after certain years and are difficult to place them in Kanji house. In 2001, the reserve authority killed 167 feral buffaloes inside the reserve. However, they cannot do anything for feral cattle as they are sacred animal and this initiative was found ineffective.

In order to establish alternate population of Wild Water Buffaloes in CNP altogether fifteen individuals were translocated in 2017. This number decreased to nine after couple of months as five Wild Water Buffaloes died due to flood and one was killed by tiger in the same year. These Wild Water Buffaloes have been monitored regularly and needs to be released under soft approach. Before the release of Wild Water Buffalo into the wild, the herd size should be increased by adding additional 25 Wild Water Buffaloes.

Output

- ▶ Livestock grazing in the core area controlled and feral cattle evacuated;
- ▶ Livestock vaccinated at regular interval with the coordination with Livestock Service Office;
- ▶ The Wild Water Buffalo exchanged with neighbor countries to gain genetic purity;
- ▶ Translocation of 25 additional Wild Water Buffaloes to CNP to increase the herd size undertaken;
- ▶ Expansion of enclosures of Padampur carried out to provide forage for additional translocated Wild Water Buffaloes;
- ▶ The Wild Water Buffaloes kept in enclosures of CNP released in the wild;

Action

- ▶ Exchange of Wild Water Buffalo with India to reduce genetic erosion due to in-breeding;
- ▶ Undertake sweeping operation to evacuate livestock and feral cattle by a joint team comprising staffs of Reserve, Nepal Army, BZ institutions;
- ▶ Procure rubber boat to patrol along the river to monitor illegal activity nearby river;
- ▶ Coordinate Livestock Service Office and conservation partners to provide vaccine to livestock against potential diseases that can be transferred to Wild Water Buffaloes;

- ▶ Support community based veterinary center with materials required in medical emergencies;
- ▶ Construct three large Kanji houses, with regular repair and maintenance, at strategic location to keep the livestock and feral cattle that are found in the core area;
- ▶ Recruit three staffs to look after the Kanji house;
- ▶ Liaise with local Government to proceed the auction of captured livestock found in the core area;
- ▶ Undertake caring of livestock kept in Kanji house;
- ▶ Castrate the male livestock with the help of immobilization or darting team;
- ▶ Provide support to initiate stall feeding to the livestock;
- ▶ Provide support to build improved Kanji house (cattle camp) at Kusaha;
- ▶ Pilot improved livestock farming project;
- ▶ Undertake expansion of enclosure of Padampur making a total of 75 ha.;
- ▶ Translocate 25 additional Wild Water Buffaloes in CNP;
- ▶ Provide supplement food to translocated Wild Water Buffaloes in lean period;
- ▶ Release Wild Water Buffaloes of Padampur in the wild of CNP; and
- ▶ Repair and maintenance of enclosures at CNP.

5.2.3 Objective 3

Maintain amity between human and Wildlife by promoting participatory Wild Water Buffalo conservation.

Rationale

Human wildlife conflict has been identified as one of the challenges for Wild Water Buffalo conservation in Nepal. With the increased Wild Water Buffalo population, the human-Wild Water Buffalo conflict is expected to rise as Wild Water Buffalo comes out of the reserve and depredate agriculture crops. Despite of erection of solar fence, the local people have to stay awake whole night to guard their agriculture crops from Wild Water Buffalo. Most of the time, they have to chase away the wildlife and during the course some human casualties occur. The long-term survival of Wild Water Buffalo can be assured only by building

local stewardship towards conservation of this species. According to the relief guideline, there is provision of providing maximum of Rs. 20,000 for the damage of crops.

Output

- ▶ Boundary dispute, illegal settlement and encroachment problem resolved;
- ▶ Capacities of BZ institutions, Community Based Anti-Poaching Units (CBAPUs) and eco-clubs enhanced;
- ▶ Biodiversity conservation mainstreamed in operational plans of community managed forests;
- ▶ Local livelihood improved through implementation of income generating activities through BZ program;
- ▶ Community level relief funds created in BZUCs and effective relief delivery mechanism in place;
- ▶ Provisions to control crop depredation by Wild Water Buffalo in place and community-based insurance scheme initiated; and
- ▶ Human-Wild Water Buffalo conflict reduced with the reduction in human casualty by Wild Water Buffalo; and
- ▶ Conservation awareness towards Wild Water Buffalo conservation increased.

Action

- ▶ Provide skills for saving and credit scheme and capital mobilization through their cooperative;
- ▶ Impart skills for alternative income generation activities;
- ▶ Provide livelihood intervention package to the victim of human-Wild Water Buffalo conflict;
- ▶ Erect solar fence in the western side of Saptari;
- ▶ Regular support for repair and maintenance of solar fence;
- ▶ Provide support to practice alternate crops that are not preferred by wildlife;
- ▶ Install Closed Circuit Television (CCTV) cameras in the dyke to monitor the wildlife entering in the BZ as well as people's illegal movement into the reserve;
- ▶ Provide training to BZUCs to regulate relief fund in effective manner;

- ▶ Organize meeting to resolve the issues of boundary dispute;
- ▶ Disseminate information of legal punishment for public knowledge to deter poaching activities;
- ▶ Support eco-clubs to implement conservation awareness activities;
- ▶ Implement conservation activities using print, audio and visual media: and
- ▶ Update encroachment records in both reserve and BZ to track progress of encroachment control.

5.2.4 Objective 4

Conserve viable population of Wild Water Buffalo by enhancing understanding and knowledge on conservation status, ecology, population biology, habitat dynamics and genetic integrity of Wild Water Buffalo.

Rationale

In order to ensure effective management, there should be sufficient information on bio-physical, ecological and demography of Wild Water Buffalo. Factors such as climate, hydrographic, flood, siltation, wildlife habitat and its dynamism, animal population and their ecological requirement, diseases and socio-economic relationship of wild animals are the major concerns for PA management. Wild Water Buffalo is moderately studied species of Nepal. However, genetic integrity of Wild Water Buffalo has not been studied well. There are still gaps in scientific knowledge for taking management decisions as there are still many unexplored areas.

Output

- ▶ Research Findings of scientific research incorporated in Wild Water Buffalo conservation;
- ▶ Standard National Guideline for Wild Water Buffalo monitoring developed;
- ▶ Status and threats of Wild Water Buffalo and its habitat dynamics understood;
- ▶ Ecological understanding of Wild Water Buffalo, their population biology and genetic integrity enhanced;
- ▶ Strategic collaboration with international and regional conservation organizations enhanced; and
- ▶ Impact of climate change on Wild Water Buffalo distribution and survival assessed.

Action

- ▶ Study on effect of invasive species to Wild Water Buffalo habitat;
- ▶ Study of grassland dynamics and its impact on Wild Water Buffalo habitat;
- ▶ Undertake study of genetic integrity of Wild Water Buffaloes;
- ▶ Periodic wetlands and water holes monitoring including water quality;
- ▶ Monitor spatial and temporal pattern of fire incidence;
- ▶ Carry out study of demography of Wild Water Buffalo;
- ▶ Conduct study of grazing pressure by local livestock in the core area;
- ▶ Undertake study about the diseases in Wild Water Buffalo and domestic buffalo including local livestock;
- ▶ Study ecological processes that affect in maintaining healthy wildlife population;
- ▶ Undertake assessment and lesson learning of translocation of Wild Water Buffalo in CNP;
- ▶ Conduct study of climate change indicators and impact on Wild Water Buffalo conservation;
- ▶ Study land cover change using geo information and earth observation science;
- ▶ Undertake identification and spatial mapping of encroachment;
- ▶ Carry out study of impacts due to construction of infrastructures to Wild Water Buffalo conservation;
- ▶ Undertake assessment of socio-economic condition of local people in the areas where human-wildlife conflict is high;
- ▶ Prepare bibliography of the literatures for which studies were conducted in KTWR;
- ▶ Monitoring of Wild Water Buffalo on periodic basis; and
- ▶ Undertake Wild Water Buffalo census as every four years.

5.2.5 Objective 5

Strengthen human, financial, and technical resources for conserving Wild Water Buffaloes

Rationale

The staff knowledge, skills and trainings are not sufficient to meet the growing management challenges of the PA. The frontline staffs are mostly untrained due to huge turnover in every two or three years as they leave the job after fulfilling basic requirement of years of service for better opportunity. The training requirements include emerging techniques on legal and anti-poaching operation, wildlife handling techniques and firefighting etc. The budget allocation in the PA is inadequate therefore; conservation partners have to be called upon to impart the various training.

Output

- ▶ Local and national technical capacity to manage Wild Water Buffalo enhanced;
- ▶ Cooperation and coordination among key stakeholders and conservation partners strengthened; and
- ▶ Provincial and Local Governments allocate budget for Wild Water Buffalo conservation;

Action

- ▶ Orientation training on social mobilization;
- ▶ Provide CITES training to PA staffs and BZ institutions;
- ▶ Train staffs towards wildlife habitat monitoring;
- ▶ Build capacity of frontline staff to recognize record and report disease or poor health condition of animals or plants;
- ▶ Train staff to collect sample of blood, fecal matter, urine or vital organs;
- ▶ Conduct training on wildlife health condition assessment;
- ▶ Provide wildlife management and handling training;
- ▶ Training to maintain amity between human-wildlife;
- ▶ Carry out forest fire control training to staffs and security personnel including BZCF members;
- ▶ Organize meeting of conservation partners to attract funds and to pull the resources;
- ▶ Undertake Mid-term review of the action plan; and
- ▶ Undertake evaluation of the action plan in the fourth year of implementation.



Activity, Budget, and Logical Framework

6.1 Activity and Budget

The budget required for the implementation of the activities prescribed by the plan for the period of five years is estimated and presented in Annex V. The summary of the activities and budget of the action plan 2020-2024 for the period of five years is presented in Table 1. For the implementation of

activities NRs. 168,359,000.00 (One hundred sixty-eight million three hundred fifty-nine thousand Nepali rupees) is required. The budget distributed in the five outputs shows that greater emphasis is being given to habitat management with 50.52%. It is mainly because this output includes the area extension of KTWR in the northern and southern part.

Table 1: Proposed Year-wise Budget Allocation (NRs. '000)

SN	Activities	1st Year	2nd Year	3rd Year	4th Year	5th Year	Total Amount	Percent
1	Habitat Management	22,917	24,850	24,658	6,181	6,450	85,056	50.52
2	Wild Water Buffalo Conservation	12,615	16,371	7,552	5,595	6,162	48,294	28.69
3	Maintain amity between Human and Wild Water Buffalo	2,813	2,454	4,405	4,261	2,910	16843	10.00
4	Study, Research and Monitoring	1,488	1,326	3,223	3,025	1,320	10,381	6.17
5	Strengthen human, financial, and technical resources	1,275	1,286	1,403	1,811	2,010	7,785	4.62
	Total	41,107	46,287	41,240	20,874	18,852	168,359	100

6.2 Logframe of the Action Plan

The logframe of the Wild Water Buffalo Conservation Action Plan is given in Table 2.

Table 2 : Logframe of the Action Plan

Narrative Summary	Objectively Verifiable Indicators (OVI)	Means of Verification	Risk and Assumptions
Goal			
Conserve viable and ecologically functioning populations thereby maintaining genetic integrity of Wild Water Buffalo in harmony with local people	Healthy population of Wild Water Buffalo increased with the reduced illegal grazing	<ul style="list-style-type: none"> Wild Water Buffalo census reports Annual progress Report Progress Report of conservation partners Study Reports and Research Papers 	<ul style="list-style-type: none"> Supportive policy and priority of the Province/Local GoN/ Federal GoN
Objectives and Outputs			
Objective 1			
Improve and expand the habitat of KTWR to provide adequate forage and wallowing sites to ensure the viability and ecological functionality of Wild Water Buffalo population	<ul style="list-style-type: none"> Wild Water Buffalo habitat improved Improved and Restored wetland and grassland Alien Invasive Species invaded area controlled Fire incidence Wild Water Buffalo bearing PA and its BZ reduced 	<ul style="list-style-type: none"> Annual progress Report Progress Report of conservation partners Study Reports and Research Papers Articles in the newspaper Documentary 	<ul style="list-style-type: none"> Adequate budget and staff provided to implement management activities
Output 1			
<ul style="list-style-type: none"> Critical grassland and wetlands identified and mapped Critical wetlands restored Invasive species controlled Grassland managed and improved Expansion of the Wild Water Buffalo habitat accomplished 	<ul style="list-style-type: none"> Ha. of grassland improved No. of wetland restored and improved Ha. of Alien Invasive Species invaded area controlled Ha. of Wild Water Buffalo habitat expanded 	<ul style="list-style-type: none"> Habitat monitoring report Water quality assessment records GIS mapping report of grassland wetland and Alien Invasive Species Articles in the newspaper Documentary 	<ul style="list-style-type: none"> Climate change does not induce invasive species, forest fire and shortage of water

Narrative Summary	Objectively Verifiable Indicators (OVI)	Means of Verification	Risk and Assumptions
Objective 2			
<p>Conserve Wild Water Buffalo population by prohibiting illegal grazing of domestic buffalo and cattle to control competition, disease transmission, genetic introgression and rewilding the translocated population</p>	<ul style="list-style-type: none"> • Illegal grazing by domestic livestock and feral cattle reduced • Domestic livestock are castrated to control population growth • Local GoN proceed the auction of feral cattle • Livestock are vaccinated with the support of Livestock Service Office • Rewilding of translocated Wild Water Buffalo of CNP 	<ul style="list-style-type: none"> • Annual progress Report • Progress Report of conservation partners • Study Reports and Research Papers • Articles in the newspaper • Documentary 	<ul style="list-style-type: none"> • Illegal grazing is addressed with the support of Political Parties
Output 2			
<ul style="list-style-type: none"> • Livestock grazing in the core area controlled and feral cattle evacuated • Livestock vaccinated at regular interval with the coordination with Livestock Support Office • The Wild Water Buffalo exchanged with neighbor countries to gain genetic purity • Translocation of 25 additional Wild Water Buffalo to increase the herd size undertaken • Expansion of enclosures of Padampur is carried out to provide forage for additional translocated Wild Water Buffaloes • The Wild Water Buffaloes kept in enclosures of CNP released in the wild 	<ul style="list-style-type: none"> • No. of domestic livestock and feral cattle reduced • No. of livestock castrated • No. of livestock auctioned • No. of livestock kept in Kanji house; • No. of livestock vaccinated • Increased no. of Wild Water Buffalo in census • No. of translocated Wild Water Buffalo release in the wild of CNP 	<ul style="list-style-type: none"> • Periodic grazing assessment report • Annual vaccination report by Livestock Service Office • Quarterly monitoring report • Annual Progress Report • Articles in the newspaper • Translocation of additional Wild Water Buffalo in Padampur, CNP report • Rewilding of translocated Wild Water Buffalo report • Documentary 	<ul style="list-style-type: none"> • Illegal grazing problem is solved in win-win situation

Narrative Summary	Objectively Verifiable Indicators (OVI)	Means of Verification	Risk and Assumptions
Objective 3			
<p>Maintain amity between human and Wildlife by promoting participatory Wild Water Buffalo conservation</p>	<ul style="list-style-type: none"> • Increased participation of BZ communities in Wild Water Buffalo conservation • Improved delivery of relief fund towards the victim of Wild Water Buffalo human conflict • Solar fence erected in the Western sector 	<ul style="list-style-type: none"> • Annual progress Report • Progress Report of conservation partners • Best Practice and Lesson Learnt Reports • Research publications 	<ul style="list-style-type: none"> • BZ communities are positive to cooperate with effective coordination and collaboration
Output 3			
<ul style="list-style-type: none"> • Boundary dispute, illegal settlement and encroachment problem is addressed • Capacities of BZ institutions, Community Based Anti-Poaching Units (CBAPUs) and eco-clubs enhanced • Biodiversity conservation mainstreamed in operational plans of community managed forests • Local livelihoods improved through implementation of income generating activities through BZ program • Community level relief funds created in BZUCs and effective relief delivery mechanism in place • Community-based insurance scheme initiated • Human-Wild Water Buffalo conflict reduced 	<ul style="list-style-type: none"> • No. of Reserve and people conflict reduced • No. of reduced casualties and crop damage by Wild Water Buffaloes • Km. of solar fence erected • No. of local people participation in conservation activities 	<ul style="list-style-type: none"> • Encroachment report • Training reports • Random survey report of Livelihood intervention • Relief fund delivery report • Human-Wild Water Buffalo conflict assessment report • Annual progress Report • Progress Report of conservation partners • Interview of local people in newspaper, radio and TV 	<ul style="list-style-type: none"> • Amity between PA and BZ communities are improved and maintained

Narrative Summary	Objectively Verifiable Indicators (OVI)	Means of Verification	Risk and Assumptions
Objective 4			
<p>Conserve viable population of Wild Water Buffalo by enhancing understanding and knowledge on conservation status, ecology, population biology, habitat dynamics and genetic integrity of Wild Water Buffalo</p>	<ul style="list-style-type: none"> Studies related to Wild Water Buffalo conservation carried out in coordination with conservation partners and Research institutions. 	<ul style="list-style-type: none"> Annual progress Report Progress Report of conservation partners Research publications 	<p>Conservation Partners and Research Institutions collaborate with Wild Water Buffalo bearing PAs</p>
Output 4			
<ul style="list-style-type: none"> Research Findings of scientific research incorporated in Wild Water Buffalo conservation Standard 'National Protocol for Wild Water Buffalo Monitoring' developed Status and threats of Wild Water Buffalo and its habitat dynamics understood Ecological understanding of Wild Water Buffalo, their population biology and genetic integrity enhanced Strategic collaboration with international and regional conservation organizations enhanced Impact of climate change on Wild Water Buffalo distribution and survival assessed 	<ul style="list-style-type: none"> No. of studies, research and assessments undertaken and published 	<ul style="list-style-type: none"> Annual progress Report Progress Report of conservation partners Research publications DNPWC annual report 	<p>Conservation Partners and Research Institutions collaborate with Wild Water Buffalo bearing PAs</p>

Narrative Summary	Objectively Verifiable Indicators (OVI)	Means of Verification	Risk and Assumptions
Objective 5			
Strengthen human, financial, and technical resources for conserving Wild Water Buffaloes	<ul style="list-style-type: none"> • PA staff trained and oriented • Conservation Partners involved in Wild Water Buffalo conservation • Increased amount of resources pooled to conserve Wild Water Buffalo through conservation partners and Local GoN 	<ul style="list-style-type: none"> • Annual progress Report • Progress Report of conservation partners • HRD reports • DNPWC reports, records of correspondence 	Motivation of staff is continued
Output 5			
<ul style="list-style-type: none"> • Local and national technical capacity to manage Wild Water Buffalo enhanced • Cooperation and coordination among key stakeholders and conservation partners strengthened, • Local Government allocate budget for Wild Water Buffalo conservation 	<ul style="list-style-type: none"> • No. of staff trained and oriented • No. of conservation Partners involved in Wild Water Buffalo conservation • Amount of resources generated through conservation partners and Local GoN 	<ul style="list-style-type: none"> • Training reports • Progress Report of conservation partners • Minutes of the meeting with conservation partners and Local GoN • Financial reports 	Adequate fund is generated to conserve Wild Water Buffalo
Activities			
Habitat management <ul style="list-style-type: none"> • Conduct mapping of all critical habitats (grasslands and wetlands) and assess their successional dynamics to inform management prescriptions; • Study preferred grass species for Wild Water Buffalo and carry out plantation; • Carry out grassland management by manual cutting, uprooting and/or controlled burning; • Restore important wallowing spots by improving the water supply; • Install solar water pump at to provide water in the wetlands; • Undertake inventory and mapping of invasive species; • Control invasive species by uprooting, drying and burning; • Organize dialogue with Koshi Project personnel on a regular basis about the maintenance of wetlands caused by sand dredging to channelize the river course; • Construct water holes at extended habitat; • Conduct dialogue with local community and political parties about the reserve extension report; • Organize exposure visit of BZ institutions, key stakeholders including representative of political parties to the successful extended PA; 			85,056,250

Narrative Summary	Objectively Verifiable Indicators (OVI)	Means of Verification	Risk and Assumptions
<ul style="list-style-type: none"> • Support media correspondent to visit other extended PA and publish article with respect to KTWR; • Provide compensation for the registered land; • Provide skill development training followed by support to adopt self-employment to the illegal settlers and encroachers; • Demarcate the extended area 			
<p>Wild Water Buffalo Conservation</p> <ul style="list-style-type: none"> • Exchange of Wild Water Buffalo with India to reduce genetic erosion due to in-breeding; • Undertake sweeping operation to evacuate livestock and feral cattle by a joint team comprising staffs of Reserve, Nepal Army, BZ institutions; • Procure rubber boat to patrol along the river to monitor illegal activity nearby river; • Coordinate Livestock Service Office and conservation partners to provide vaccine to livestock against potential diseases that can be transferred to Wild Water Buffaloes; • Support community based veterinary center with materials required in medical emergencies; • Construct three large Kanji houses, with regular repair and maintenance, at strategic location to keep the livestock and feral cattle that are found in the core area; • Recruit three staffs to look after the Kanji house; • Liase with local Government to proceed the auction of captured livestock found in the core area; • Undertake caring of livestock kept in Kanji house; • Castrate the male livestock with the help of immobilization or darting team; • Provide support to initiate stall feeding to the livestock; • Provide support to build improved Kanji house (cattle camp) at Kusaha; • Pilot improved livestock farming project; • Undertake expansion of enclosure of Padampur making a total of 75 ha.; • Translocate twenty-five additional Wild Water Buffaloes in CNP; • Provide supplement food to translocated Wild Water Buffaloes in lean period; • Release Wild Water Buffaloes of Padampur in the wild of CNP; and • Repair and maintenance of enclosures at CNP. 			48,294,000

Narrative Summary	Objectively Verifiable Indicators (OVI)	Means of Verification	Risk and Assumptions
<p>Improve and maintain amity between Human and Wild Water Buffalo</p> <ul style="list-style-type: none"> • Provide skills for saving and credit scheme and capital mobilization through their cooperative; • Impart skills for alternative income generation activities; • Provide livelihood intervention package to the victim of human-wildlife conflict; • Erect solar fence in the western side of Saptari; • Regular repair and maintenance of solar fence; • Provide support to practice crops that are not preferred by wildlife; • Install Closed circuit Television (CCTV) camera in the dyke to monitor the wildlife entering in the BZ as well as people's illegal movement into the reserve; • Provide training to BZUCs to regulate relief fund in effective manner to support human injury and casualty; • Organize meeting to resolve the issues of boundary dispute; • Disseminate information of legal punishment for public knowledge which is effective to deter poaching activities; • Support eco-clubs to implement conservation awareness activities; • Implement conservation activities using print, audio and visual media: and • Update encroachment records in both reserve and BZ to track the progress of encroachment control. 		16,843,125	
<p>Study, Research and Monitoring</p> <ul style="list-style-type: none"> • Study of effect of invasive species to wildlife habitat; • Study of grassland dynamics and its impact on Wild Water Buffalo habitat; • Undertake habitat monitoring, prepare check list of food plants, document physical and phenological changes in vegetation; • Periodic wetlands and water holes monitoring including water quality; • Monitor spatial and temporal pattern of fire incidence; • Carry out study of demography of Wild Water Buffalo; • Conduct study of grazing pressure by local livestock in the core area; • Undertake study about the diseases in Wild Water Buffalo and domestic buffalo including local livestock; • Study ecological processes that affect in maintaining healthy wildlife population; • Undertake assessment and lesson learning of translocation of Wild Water Buffalo in CNP; • Conduct study of climate change indicators and impact on Wild Water Buffalo conservation; • Study land cover change using geo information and earth observation science; • Undertake identification and spatial mapping of encroachment; • Carry out study of impacts due to construction of infrastructures to Wild Water Buffalo conservation; • Undertake assessment of socio-economic condition of local people in the areas where human-wildlife conflict is high; • Prepare bibliography of the literatures for which studies were conducted in KTWR; • Monitoring of Wild Water Buffalo on periodic basis; and • Undertake Wild Water Buffalo count as every four years. 		10,380,625	

Narrative Summary	Objectively Verifiable Indicators (OVI)	Means of Verification	Risk and Assumptions
<p>Strengthen human, financial, and technical resources</p> <ul style="list-style-type: none"> • Orientation training on social mobilization; • Provide CITES training to PA staffs and BZ institutions; • Train staffs towards wildlife habitat monitoring; • Build capacity of frontline staff to recognize record and report disease or poor health condition of animals or plants; • Train staff to collect sample of blood, fecal matter, urine or vital organs; • Conduct training on wildlife health condition assessment; • Provide wildlife management and handling training; • Training to maintain amity between human-wildlife; • Carry out forest fire control training to staffs and security personnel including BZCF members; • Organize meeting of conservation partners to attract funds and to pool the resources; • Undertake Mid-term review of the action plan; and • Undertake evaluation of the action plan in the fourth year of implementation. 		7,785,000	
Total (In NRs.)		168,359,000	





Plan Implementation and Monitoring

7.1 Implementing Agency

Most of the activities will be directly managed through Wild Water Buffalo bearing PA management authorities and DNPWC. Specific activities associated with PAs will be managed by the concern PA management authority, whereas, common and cross-cutting activities will be managed by the DNPWC. Regarding the Koshi Project run by the Government of India, discussion will be held in BZMC in participation of other relevant stakeholders. Decision will be taken about project' contradictory works such as diversion of natural course of Koshi River, cleaning of bush, vehicle mobility in day and night during rainy season in reserve area.

The activities that are to be implemented outside of PAs will be managed by forest offices at local level. Most of the researches and studies will be conducted by NTNC, WWF, ZSL, IUCN, universities in partnership and coordination with DNPWC. Similarly, other research organizations will also be encouraged to support and conduct research on Wild Water Buffalo conservation. Technical and financial support from conservation partners such as NTNC, IUCN, WWF, and ZSL will be sought to implement the plan. The involvement of BZ institutions (BZMC, BZUCs, and BZCFs), local communities, eco-clubs, CBAPUs and security forces have important role in the implementation of activities. Besides, Province Government, Local Governments and Non- Government Organizations will also have great contribution in the implementation of this plan.

7.1.1 Human Resources and Capacity Development

Inadequate staff significantly hampers effective

conservation and management of PAs but as the approved positions are fulfilled, the management capacity is expected to improve to a greater extent. Therefore, attempts will be made to fulfill the staffs as soon as the positions are vacant. The DNPWC will primarily search for, and conduct training opportunities in areas such as monitoring techniques, Wild Water Buffalo ecology, genetic studies, database and knowledge management, anti-poaching, control of problematic animals like Wild elephant as well as other new technology including community mobilization in BZ. Incentive package such as exposure, training, higher studies, rewards, proper job placement etc. and encourage their staff to undertake Wild Water Buffalo conservation activities with high morale.

7.1.2 Governance

DNPWC and Wild Water Buffalo bearing PAs will maintain transparency and accountability in deliberation of programs and financial transactions. The funding from the development partners will be made public through annual and periodic reports. Regular supervision, monitoring, and providing guidance in implementation of the plan will be done by respective authorities. The periodic progress reports and other publications will also be made public periodically.

7.1.3 Coordination

The effective coordination among relevant stakeholders will be maintained through the existing government system and a mechanism set for the implementation of a particular program or project. The concerned departments and field offices will have the primary responsibility to coordinate with concerned stakeholders at central and field levels respectively.

7.2 Financial Plan

Total estimated cost for the implementation of the action plan is NRs. 168,359,000 (One Hundred Sixty-eight Million Three Hundred Fifty-nine Thousand Nepali Rupees). The fund will be managed from Government regular budget under MoFE including Province and Local Governments, existing conservation partners such as NTNC, IUCN, WWF, and ZSL. The other national and international conservation organizations will be encouraged to seek the fund for the plan implementation. Detail breakdown of the budget is presented in the Annex I.

7.3 Monitoring and Evaluation of Plan Implementation

The monitoring and evaluation of the implementation of this action plan will be carried out regularly during the five-years period. Timeline for each activity has been indicated on yearly basis. Each of the responsible institution for implementation will work

out a detailed work plan for every activity prior to the beginning of fiscal years. The action plan will guide implementing organizations for program development and implementation in the field. Monitoring of the progress will be carried out by respective implementing organizations and partners on a regular basis including Province and Local Governments. The DNPWC, KTWR and CNP will compile all their progress and present at central level review annually. Review will be focused on the achievements made on planned activities in that fiscal year, issues while implementing the plan and development of a detailed work plan for forthcoming year's activities. Major conservation partners will be invited in the review meeting. A mid-term and final review of the action plan will be conducted by a team of independent experts who will be outsourced by the DNPWC. Both the mid-term and final review findings will be shared in national level workshops. The log-frame of the action plan is presented in Table 2 where the objectively verifiable indicators and means of verification at output level of the plan is also provided.

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Annexes

Annex I: Detail Breakdown of Five-year Activities of Action Plan

SN	Activities	Unit	Qty.	Rate	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year	Total Amount
1	Habitat Management									
1.1	Conduct mapping of all critical habitats (grasslands and wetlands) and assess their successional dynamics	Times	2	500000	500000				600000	1100000
1.2	Plantation of preferred grass species for Wild Water Buffalo	Ha.	100	15000	300000	315000	330000	345000	360000	1650000
1.3	Carry out grassland management by manual cutting, uprooting and/or controlled burning	Ha.	250	25000	1250000	1312500	1375000	1437500	1500000	6875000
1.4	Restore important wallowing spots by improving the water supply	No.	10	300000	600000	630000	660000	690000	720000	3300000
1.5	Install solar water pump to provide water in the water deficient wetlands	No.	1	750000		787500				787500
1.6	Undertake inventory and mapping of invasive species	No.	2	500000		525000		575000		1100000
1.7	Control invasive species by uprooting, drying and burning	Ha.	100	20000	400000	420000	440000	460000	480000	2200000
1.8	Organize dialogue with Koshi Project personnel on a regular basis about the maintenance of wetlands caused by sand dredging in channelizing the river course	Times	5	50000	50000	52500	55000	57500	60000	275000
1.9	Construct water holes at water deficient areas	No.	10	400000	800000	840000	880000	920000	960000	4400000
1.10	Conduct dialogue with local community and political parties about the reserve extension report	No.	15	75000	225000	236250	247500	258750	270000	1237500

SN	Activities	Unit	Qty.	Rate	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year	Total Amount
1.11	Organize exposure visit of BZ institutions, key stakeholders including representative of political parties to the successful extended PA	No.	3	500000	500000	525000	550000			1575000
1.12	Support media correspondent to visit other extended PA and publish article with respect to KTWR	No.	15	75000	375000	393750	412500			1181250
1.13	Provide compensation for the registered land	Bigha	25	2000000	16666667	17500000	18333333			52500000
1.14	Provide skill development training followed by support to adopt self-employment to the illegal settlers and encroachers	HH	150	25000	750000	787500	825000	862500	900000	4125000
1.15	Demarcate the extended area	Km	5	500000	500000	525000	550000	575000	600000	2750000
	Sub Total				22916667	24850000	24658333	6181250	6450000	85056250
2	Species Conservation									
2.1	Exchange of Wild Water Buffalo with India to reduce genetic erosion by in-breeding;	Times	1	1000000	1000000					1150000
	Undertake sweeping operation to evacuate livestock and feral cattle by a joint team comprising staffs of Reserve, Nepal Army, BZ institutions	Times	5	500000	500000	525000	550000	575000	600000	2750000
2.2	Procure rubber boat to patrol along the river to monitor illegal activity nearby river	No.	1	1500000	1575000					1575000
2.3	Coordinate Livestock Service Office and conservation partners to provide vaccine to livestock against potential diseases that can be transferred to Wild Water Buffaloes	Times	5	600000	630000	660000	690000	720000		3300000
2.4	Support community based veterinary center with materials required in medical emergencies	Times	1	75000	78750					78750

SN	Activities	Unit	Qty.	Rate	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year	Total Amount
2.5	Construct 3 large Kanji house, with regular repair and maintenance, at strategic location to keep the livestock and feral cattle that are found in the core area	No.	3	2500000	2500000	2625000	2750000			7875000
2.6	Recruit 3 staffs to look after the Kanji house	No.	15	195000	585000	614250	643500	672750	702000	3217500
2.7	Liase with local Government to proceed the auction of captured livestock found in the core area	Times	5	250000	250000	262500	275000	287500	300000	1375000
2.8	Undertake caring of livestock kept in Kanji house	Times	5	400000	400000	420000	440000	460000	480000	2200000
2.9	Castrate the male livestock with the help of immobilization or darting team	Times	3	1000000	1000000		1100000		1200000	3300000
2.1	Provide support to initiate stall feeding to the livestock	HH	250	5000	250000	262500	275000	287500	300000	1375000
2.11	Provide support to build improved Kanji house at Kusaha	No.	1	800000					960000	960000
2.12	Pilot improved livestock farming project	No.	2	500000		525000		575000		1100000
2.13	Undertake expansion of enclosure of Padampur making a total of 75 ha.	Times	1	11500000	5750000	5750000				11500000
2.14	Translocate 25 additional Wild Water Buffaloes in CNP	Times	1	1500000		1575000				1575000
2.15	Provide supplement food to translocated Wild Water Buffaloes in lean period	Times	4	350000	280000	294000	308000	322000		1204000
2.16	Release Wild Water Buffaloes of Padampur in the wild of CNP	Times	1	250000					300000	300000
2.17	Repair and maintenance of enclosures at CNP	Times	5	500000	500000	525000	550000	575000	600000	2750000
	Sub Total				45625000	12615000	16370750	7551500	5594750	6162000

SN	Activities	Unit	Qty.	Rate	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year	Total Amount
3	Improve and maintain amity between Human and Wild Water Buffalo									
3.1	Provide skills for saving and credit scheme and capital mobilization through their cooperative	No.	2	150000		157500		172500		330000
3.2	Impart skills for alternative income generation activities	No.	3	250000	250000		275000		300000	825000
3.3	Provide livelihood intervention package to the victim of human-Wild Water Buffalo conflict	No.	50	25000	250000	262500	275000	287500	300000	1375000
3.4	Erect solar fence in the western side of Saptari	Km	5	750000			1875000	1875000		3750000
3.5	Regular repair and maintenance of solar fence	Times	1	1500000	300000	315000	330000	345000	360000	1650000
3.6	Provide support to practice crops that are not preferred by wildlife	Times	5	300000	300000	315000	330000	345000	360000	1650000
3.7	Install Closed circuit Television (CCTV) camera in the dyke to monitor the wildlife entering in the BZ as well as people's illegal movement into the reserve	No.	15	35000	262500	275625				538125
3.8	Provide training to BZUCs to regulate relief fund in effective manner	No.	2	125000	125000		137500			262500
3.9	Organize meeting to resolve the issues of boundary dispute	No.	15	50000	150000	157500	165000	172500	180000	825000
3.10	Disseminate information of legal punishment for public knowledge which is effective to deter poaching activities	Times	5	150000	150000	157500	165000	172500	180000	825000
3.11	Support eco-clubs to implement conservation awareness activities	Times	5	175000	175000	183750	192500	201250	210000	962500

SN	Activities	Unit	Qty.	Rate	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year	Total Amount
3.12	Implement conservation activities using print, audio and visual media: and			Times						
3.13	Update encroachment records in both reserve and BZ to track the progress of encroachment control	Times	2	250000	250000				300000	550000
	Sub Total				2812500	2454375	4405000	4261250	2910000	16843125
4	Study, Research and Monitoring									
4.1	Study of effect of invasive species to Wild Water Buffalo habitat	Times	1	300000				345000		345000
4.2	Study of grassland dynamics and its impact on Wild Water Buffalo habitat	Times	1	500000	500000					500000
4.3	Undertake study of genetic integrity of Wild Water Buffaloes	Times	5	300000	300000	315000	330000	345000	360000	1650000
4.4	Periodic wetlands and water holes monitoring including water quality	Times	5	250000	250000	262500	275000	287500	300000	1375000
4.5	Monitor spatial and temporal pattern of fire incidence	Times	2	300000	315000			345000		660000
4.6	Carry out study of demography of Wild Water Buffalo	Times	3	250000	250000			287500	300000	837500
4.7	Conduct study of grazing pressure by local livestock in the core area	Times	3	300000	300000	315000	330000			945000
4.8	Undertake study about the diseases in Wild Water Buffalo and domestic buffalo including local livestock	Times	3	500000			550000	575000	600000	1725000
4.9	Study ecological processes that affect in maintaining healthy wildlife population	Times	2	400000		420000			480000	900000
4.10	Undertake assessment and lesson learning of translocation of Wild Water Buffalo in CNP	Times	2	300000	300000			345000		645000

SN	Activities	Unit	Qty.	Rate	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year	Total Amount
4.11	Conduct study of climate change indicators and impact on Wild Water Buffalo conservation	Times	2	350000	350000				420000	770000
4.12	Study land cover change using geo information and earth observation science	Times	2	300000	300000			345000		645000
4.13	Undertake identification and spatial mapping of encroachment	Times	1	250000	250000					250000
4.14	Carry out study of impacts due to construction of infrastructures to Wild Water Buffalo conservation	Times	1	300000					300000	300000
4.15	Undertake assessment of socio-economic condition of local people in the areas where human-wildlife conflict is high	Times	3	400000	400000		440000		480000	1320000
4.16	Prepare bibliography of the literatures for which studies were conducted in KTWR	Times	1	300000				345000		345000
4.17	Monitoring of Wild Water Buffalo on periodic basis	Times	5	300000	300000	315000	330000	345000	360000	1650000
4.18	Undertake Wild Water Buffalo count as every five years	Times	1	1000000				1150000		1150000
	Sub Total				1487500	1325625	3222500	3025000	1320000	10380625
5	Strengthen human, financial, and technical resources									
5.1										
5.2	Orientation training on social mobilization	Times	2	500000		525000		575000		1100000
5.3	Provide CITES training to PA staffs and BZ institutions	Times	3	125000	125000		137500		150000	412500
5.4	Train staffs towards wildlife habitat monitoring	No.	2	150000		157500		172500		330000

SN	Activities	Unit	Qty.	Rate	1 st Year	2 nd Year	3 rd Year	4 th Year	5 th Year	Total Amount
5.5	Build capacity of frontline staff to recognize record and report disease or poor health condition of animals or plants	years	3	175000	175000		192500		210000	577500
5.6	Train staff to collect sample of blood, fecal matter, urine or vital organs	Times	3	75000	75000		82500		90000	247500
5.7	Conduct training on wildlife health condition assessment	Times	2	125000		131250		143750		275000
5.8	Provide wildlife management and handling training	Times	3	200000	200000		220000		240000	660000
5.9	Training to maintain amity between human-wildlife	Times	5	150000	150000	157500	165000	172500	180000	825000
5.10	Carry out forest fire control training to staffs and security personnel including BZCF members	Times	5	300000	300000	315000	330000	345000	360000	1650000
5.11	Organize meeting of conservation partners to attract funds and to pool the resources	Times	3	250000	250000		275000		300000	825000
5.12	Undertake Mid-term review of the action plan;	Times	1	350000				402500		402500
5.13	Undertake evaluation of the action plan in the fourth year of implementation,	Times	1	400000					480000	480000
	Sub Total				1275000	1286250	1402500	1811250	2010000	7785000
	Total				41106667	46287000	41239833	20873500	18852000	168359000

Annex II: The Number of Wild Water Buffalo in Nepal

Years of Census	Adult Male	Adults Female	Sub-Adult Male	young Female	Juvenile (2-yr)	Infant (1-yr)	Total	Calves/Cow ratio	M/F ratio
1976	12	18	NA	NA	22	11	63	0.611	0.67
1987	32	29	NA	NA	14	16	91	0.552	1.10
1988	37	33	NA	NA	8	15	93	0.455	1.12
2000	56	53	NA	NA	17	19	145	0.358	1.06
2004	54	63	NA	NA	24	18	159	0.286	0.86
2009	55	119	NA	NA	22	23	219	0.193	0.46
2010	57	108	NA	NA	24	26	215	0.241	0.53
2011	66	117	NA	NA	15	39	237	0.333	0.56
2014	47	125	64	44	32	38	350	0.304	0.38
2016	114	180	26	20	27	66	433	0.367	0.63
2018	137	191	19	16	40	38	441	0.199	0.72





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