

Protection for Wild Water Buffalo

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Definition

Wild Water Buffalo with the scientific name *Bubalus bubalis arnee* is recorded as an imperiled species in the International Union for Conservation of Nature (IUCN's) Red List of Threatened Species which are wetland-subordinate. More number of Wild Water Buffalo in Nepal is found at the Koshi Tappu Wildlife Reserve (KTWR) which is situated on the floodplain of the Koshi River in Province 1 of the Eastern part of Nepal.

1. Introduction

Asian Wild Water Buffalo is an enormous, intensely constructed creature, without an articulated protuberance. Skin shading light dark to dark, typically mud-covered, with rather long hairs, yet numerous parts are bare, especially with age. Neck huge and thick, with a white V stumbling into the front. Temple limited, ears are huge. No dewlap on the throat. The tail has a rugged end. The 4 legs have a grayish shading that runs down from knees to hooves. Hooves huge and spread. Horns in both genders, hefty at the base, three-sided in cross-segment, and broadly spreading along the external edges, surpassing in size the horns of some other living Bovid. Horns bent like the bow moon with a tight tip. Wild Water Buffalo is bigger and heavier than Domestic Buffalo and have enormous horns with a bigger bend. Females less than males, with horns rounder in cross-segment and lighter, however perhaps more. The wild types of Water Buffalo are considered under *Bubalus arnee*, saving *Bubalus bubalis* for the homegrown and non-domesticated structures. Their subspecies incorporate *Bubalus arnee* is more modest, hazier, with all the more differentiating white beneath the knees; the tail arrives at the pawns, and the gag is white.

Generation Gestation of Asian Wild Water Buffalo is 324 days and Young for every Birth is 1, seldom 2. Additionally, weaning is 6-9 months. Their sexual development is a year and a half (♂), three years (♀). Their Life Span is 25 years. Occasional reproducers in the vast majority of their reach, ordinarily in October and November. A few populaces breed all year. Predominant ♂ mate with the ♀ of a family who thusly drives them off. Their behavior family group: Herds with ♀ and youthful drove by an old ♀; grown-up ♂ structure lone ranger gatherings of up to 10 individuals, with more established ♂ frequently singular, and spend the dry season separated from the female tribes. ♂ move into ♀ territories during the rearing season. Their diet incorporates Grazers, taking care of fundamentally on obvious grasses when accessible, for example, scutch grass, and sedges, however, they additionally eat spices, natural products, and bark, just as perusing on trees and bushes. They likewise feed on harvests, including rice, sugarcane, and jute, now and again causing extensive harm. Their principal predators are Tiger, the Asian wild bear. During the day they ordinarily wash in the mud or rest in the tall grasses. Built-up mud on the skin assists with easing the warmth and it additionally serves to shield the Wild Water Buffalo from bugs. Their distribution native is Bhutan, Cambodia, India, Myanmar, Nepal, Thailand. It has gotten terminated over quite a bit of its unique reach from loss of territory to horticulture and homegrown steers illnesses, yet a couple of crowds, which are accepted to be plunged from local stock, are as yet found available for later or distant zones of Nepal, North East India, and Indochina. Indeed, it is conceivable that no obvious wild examples exist any longer. Crossbreeding with Domestic Buffalo just as shrinkage and decimation of living space are viewed as significant dangers ^[1].

Asian Wild Water Buffalo was available in Royal Chitwan National Park in the mid-1960s however got terminated there, likely because of sicknesses conveyed by homegrown cows and buffalo brought by outsiders settling the region after the eradication of malaria ^[2]. So, the Government of Nepal (GoN) established KTWR, an IUCN Category IV protected area ^[3], in 1976 with an area of 175 Km² of Terai as the physiographic zone to protect the Nepalese Wild Buffalo ^{[1][4]}.

It was believed that Wild Water Buffalo, locally called Arna, an elderly person above 100 years of age from the indigenous Yadav community. Mr. Ragghu Yadav from Trihut rural municipality ward no.1, Dhanpuri village, Saptari district who used to stay in the Reserve for months till 2005 from herding domestic buffaloes said that three female buffaloes different than his local breeds came from the Indian side and settled in the Reserve. The progeny of those

buffaloes are today's Wild Water Buffaloes [5]. Recognizable proof of hereditarily unadulterated wild individuals is significant for distinguishing creatures for movement to different territories inside their previous reach. Phylogenetic connections inferred through a diminished middle organization and greatest stinginess examinations reconfirmed the hereditary idea of the Wild Water Buffalo [6].

The wild buffalo was perceived by the social and phenotypic characteristics, for example, white chevron, socks and tip of the tail, and bigger, moderately straight, pale-hued horns (like marsh wild ox). These rules for recognizing wild buffalo from non-domesticated backcrosses were additionally utilized before examines [7][4][8][9][10]. Wild Buffalo cohabit the reserve with highly backcrossed feral buffalo thought to have been released in the area in the 1950s [7]. Wild Water Buffalo *Bubalus arnee* is considered Endangered globally [11], with isolated populations in KTWR and selected areas of Bhutan, India, Thailand and possibly Myanmar and Cambodia [12]. In 2016, 433 Wild Buffaloes were counted in KTWR [13].

Being the lone living space, the species are inconsistent in danger of being terminated from Nepal if normal disasters, for example, floods, fires, and pandemics were to happen inside the environment. Henceforth, the essential goal of the movement of wild water Buffalo was to build up a second biologically feasible populace in Chitwan National Park, consequently given them a battling chance if there should arise an occurrence of common catastrophes. Territory misfortune, corruption, and environmental change-actuated debacles are different kinds of dangers to the populace. The movement will likewise assist with giving a maintainable protection plan to Arna. Also, the nearby partners from and around Chitwan National Park will profit from the advancement of eco-the travel industry comparable to Wild Water Buffalo.

In 2016, 18 individuals of Wild Water Buffaloes were translocated from KTWR to Chitwan National Park. Translocation was carried out by a team of 60 people including three veterinarians and 12 wildlife technicians led by DNPWC with support from the World Wildlife Fund Nepal, the USAID-supported Hariyo Ban Program, National Trust for Nature Conservation, Biodiversity Conservation Centre (NTNCBCC), and the Zoological Society of London (Nepal) [14].

The preparation for the capture and release of Wild Water Buffalo had started on 1st December 2016. Arrangements included setting up a walled-in area of 30 hectares and fortifying it with sun based fueled fence, and living space for the executives. Moreover, 2 wooden confines were ready for post catch tasks, and normal neighborhood-level gatherings with concerned partners and networks were led before the catch and delivery. The statistics were done in the Reserve, the solitary house for these wild monsters in the nation, by the KTWR, National Nature Conservation Trust, Buffer Zone Consumer Committee, Buffer Zone Community User Forest Group, and Bhagawati Prasad Battalion during March and April, shared Narayan Rupakheti, Information official of the DNPWC. The creature with the logical name *Bubalus arnee* is recorded as a jeopardized species in the IUCN's Red List of Threatened Species [15]. Set up in 1976 more than 65 65 km²; reached out to its current size in 1980 by including the flood fields of the Koshi River to ensure the last remainder populace of wild water-buffaloes Declared a Ramsar site on 17 December 1987 [13]; and buffer zone in 2004 [1].

Safeguarding of the last remainder populace of the fundamentally imperiled wild water buffaloes and their territories; an extensive administration procedure structure and plan has been readied including key KTWR partners. Built-up a proposition for the movement of the wild water-buffalo inside Nepal [13]. Around 500 homegrown wild buffaloes have been cleared from the reserve. Different sorts of exploration have been done at KTWR under DNPWC: Research did from 1999-2000 remembered reads for crop harm and domesticated animals theft, riverine woods, the Arna territory, and the bog partridge. Three examinations directed from 2000-2001 evaluated the financial aspects of the wild buffalo, planned difficulties in the Reserve buffer zone, and a 'nilgai' (blue bull) study [16]. The Wild water buffalo (*Bubalus arnee*) has increased from 63 in 1976 [7], to 441 in 2018 [5] as in Table 1.

Given the precarious existence of Wild Buffalo within KTWR, several wildlife conservationists have emphasized the need to translocate a sufficient number of individuals to sites within their indigenous range. Chitwan National Park had this species at least until the 1950s [17] and has extensive grassland areas, and much larger riverine habitats with sufficient upland areas that are not prone to flooding, compared to KTWR [18]. For these reasons 18 Wild Buffaloes were translocated to Chitwan National Park from KTWR recently, and more need to be moved soon [19][20].

A portion of the individuals has been moved to Chitwan National Park of Central Nepal however the endurance rate isn't acceptable. There was an investigation directed in the Babai flood plain of Bardia National Park (BNP) to recognize reasonable territory for wild water buffalo dependent on natural surroundings boundaries of KTWR. The examination utilized both the geospatial and vegetation investigation strategy [21]. Babai flood plain of BNP is a decently reasonable living space for wild water buffalo. Prairie and wetland the executives and investigation of different boundaries, for example, atmosphere and prey-hunter relationship are prescribed before settling on the choice to move wild water buffalo to the Babai flood plain of BNP.

2. Wild Water Buffalo Conservation

The Wild water Buffalo *Bubalus arnee*(Kerr, 1792) also known as Arna in Nepali, is a robust animal, believed to be distributed in Europe and southern Asia in the Pleistocene age, but was later restricted to Southeast Asia [Khatri e.al, 2012]. At present, the Asiatic Wild Water Buffalo occurs in India, Nepal, Bhutan, Myanmar, Thailand and Cambodia [Khatri et.al, 2012]. In Nepal, these species are restricted to Reserve (KTWR) only. To establish a second viable population, 13 Wild Water Buffalo (10 F, 3M) were translocated to Chitwan National Park from Jan 27-Feb 7, 2017. In Nepal, it has been accorded the highest degree of protection under the National Parks and Wildlife Conservation Act, 1973. Outside Nepal, Wild Water Buffalo is legally protected in Bhutan, India and Thailand. A recent census conducted in 2018 recorded 441 individuals with 191 adult females. The population is in increasing trend since the Reserve establishment from 63 in 1976 (Table1). This species occasionally moves into adjoining areas in the buffer zone in Saptari, Sunsari and Udaypur districts on either side of the Koshi River of the reserve. The global population of Wild Water Buffalo is estimated to be less than 4,000 individuals.

The grown-up sex proportion was female-one-sided in 1976, 2004 [Heinen and Kandel 2006] and again in 2009, yet male-one-sided in the three interceding censuses. A most enormous well-evolved creature populaces have female-one-sided grown-up sex proportions [Bronson 1989; Heinen and Kandel 2006]. The calf/cow proportion has diminished essentially throughout the entire period. The calf/cow proportion detailed for Arna in KTWR in all cases is steady with the known scope of characteristic interbirth spans for homegrown buffalo recorded in different investigations and this statistics additionally shows the pattern going down in calf/cows animals proportion [Cockrill 1974]. Subsequently, the evident decrease in calf/cow proportion is perhaps credited either because of the decrease in birth rate or decay of the reproducing populaces; or expansion in poaching or burglary of Arna calf or passing because of different reasons. The number of inhabitants in feral cattle was discovered to be higher than the assessed populace in 2000 [Heinen and Singh 2001] which could be ascribed to the absence of law authorization/appropriate administration.

Table 1: Population trend of Wild Water Buffalo since 1976

Year	Adults		Calves		Total	Calves to she buffaloes ratio
	Male	Female	2nd year	1st year		
1976	12	18	22	11	63	0.61
1987	32	29	14	16	91	0.55
1988	37	33	8	15	93	0.45
2000	56	53	17	19	145	0.36

2004	54	63	24	18	159	0.29
2009	55	119	22	23	219	0.19
2010	57	108	24	26	215	0.22
2011	66	117	15	39	237	0.33
2012	67	119	37	36	259	0.30
2014	128	142	25	32	327	0.23
2016	120	182	50	81	433	0.45
2018	137	191	75	38	441	0.20

[KTWR 2018]

Conservation Efforts

Protection of its prime habitat has been ensured through security strengthening by army deployment in the posts and regular patrolling. Sweep operation and intelligence-based patrolling have been carried out to control the grazing of domestic buffaloes in their habitat. Monitoring and population census have been conducted periodically to update its status.

Issues

1. Crossbreeding with domestic buffaloes and genetic erosion
2. Habitat degradation due to high rate of sedimentation by Koshi River flood and invasive species
3. Food competition with feral cattle and livestock
4. Potential disease and parasite transmission from livestock
5. Retaliatory killing because of human-wildlife conflicts.
6. Koshi River flood hazard is a potential threat to its habitat, food supply, and existence.
7. Proposed Koshi High Dam

Strategies

1. Collaborate with an academic institution for genetic study and potential disease
2. Design project for advanced genetic study to differentiate between Wild water buffalo and domestic buffalo.
3. Translocation and introduction of new breed from Assam, India
4. Apply invasive species control measures
5. Devise regulation to control feral cattle and livestock.
6. Establish a surveillance system of disease and accidental death
7. Awareness and law enforcement to deal with Human-Wildlife Conflict

Activities

1. Manage grassland habitat with various treatments (uprooting, cutting, burning, ploughing) to control invasive species and palatable species cropping

2. Conduct Stakeholders meetings to include provisions in the regulation for livestock control in the reserve
3. Conduct an awareness campaign to mitigate HAC
4. Conduct power fence in the problem area to restrict Wild water buffaloes in the reserve
5. Conduct population census in every four-year interval
6. Conduct a feasibility study to translocate to other suitable habitat areas in the Terai region [KTWR, 2018].

3. Park-People

conflict:

KTWR is highly impacted by human activities and there is increasing conflict between the reserve authorities and people living in the area" crop damage, depredation of livestock, the human toll and resentment arising from reserve regulation are the four basic causes of "Park-People conflict [Limbu and Karki, 2003]. Due to the increased protection of wildlife crops damage on peripheral agricultural land by free moving wild animals is extensive. This turns people against conservation because the loss of crops became a heavy burden on an individual's economy.

The study results indicated that the vast majority have a negative mentality about the save despite the current immediate and roundabout advantages. These perspectives are showed severally. Numerous individuals are probably going to overestimate their expenses, for example, whine that there is probably going to overestimate their expenses, for instance, a gripe that there is all-year crop harm from wild buffalo when there and grumble those wild creatures crush the wall. A similar case was studied in Royal Chitwan National Park [Mishra and Jefferies 1991]. The crop field attracts the herbivores. The wild buffaloes are attracted towards the village areas during crop growing season (April-Oct.). The wild buffalo come out of the reserve mainly in pursuit of their supplemental seasonal food. Village respondents stated that the main reason for the field raids is the taste of succulent crop plants which are soft and palatable for wild buffalo. But there are other reasons among them the main reason for the crop-raiding is that the jungle plant and grasses cannot fulfill all their daily food requirements and that they roam in field crops.

The KTWR has had clashes with neighborhood networks since its foundation [Heinen 1993b]. Individuals living nearer to KTWR are bound to uncover negative mentalities towards preservation. Educated people and farmers have a positive protection mentality somewhat while the family units with poor financial status and more prominent reliance on the KTWR for kindling, grub, and crude materials have a more negative demeanor towards preservation [Shrestha and Alavalapati 2006]. Helpless families are less worried about preservation, and institutional settings and miserable destitution close to secured zones seem to influence their perspectives. Hence, for the maintainable administration of KTWR and neighborhood uphold for normal asset preservation, financial advancement has been started since the mid-1990s. The Park People Project (PPP), and Buffer Zone Policy, under execution, has been compelling in a few different ways [Heinen and Mehta 2000; Budhathoki 2004; Heinen and Kandel 2006] and numerous villages have profited by the projects. This was proceeded by Participatory Conservation Project (PCP) and as of late by the CSUWN task to improve save individuals disagreements by cooperating to understand the twin target of preservation and advancement.

Since KTWR is little and is encircled by villages, wild vertebrates continuous croplands when the Reserve floods; in this manner, neighborhood individuals endure direct irritations because of the presence of KTWR, thus requiring isolation of the Reserve [Heinen, 1993b]. Wild Buffalo is likewise referred to as attack anthropogenic yields, for example, rice, sugarcane, and jute from agrarian grounds on the edges of their home reach, which has prompted buffalo human clashes in and around secured zones [Choudhury, 2014].

Food: The grasslands area is the main food habitat of wild buffalo. The plants are eaten by wild buffalo and their food preference as shown in Table 2.

Table 2: Plants are eaten by Wild Water Buffalo

Scientific Name	Local Name	Food Preference

<i>Imperata Cylindria</i>	Siru	++++
<i>Sccharums sp</i> <i>Sontaneum</i>	Khar	++++
<i>Cynodon dactylon</i>	Duboo	++++
<i>Typha elephanta</i>	Nercut	+++
<i>Sccharum bengalensis</i>	Khari	+++
<i>Norenga drophyracorma</i>		+++
<i>Themeda auradinaria</i>		+++
<i>Dalbariga sissoo</i>	Sisso	+
<i>Acacia datachu</i>	Khari	+
<i>Bombox Ceiba</i>	Samal	+
<i>Fiscus bengalensis</i>	Bar	+
<i>Eugenia Jambolana</i>	Jamun	+
<i>Oryza sativa</i>	Dhan	++++
<i>Triticum aestivum</i>	Ghaun	++++
<i>Zea Mays</i>	Makai	++++

[Kherwar, 1996]



Fig1: Wild buffalo (*Babulus babalis*) standing near crop field of the Haripur Village.



Fig 2: Largest horns of wild buffalo, collected in Koshi Tappu Wildlife Reserve. The animal died due to disease, the horn span measured about 5 ft.



Fig 3: Wild and domestic calves compared. Note wild calf is a brown color and domestic is blackish.

4. Economic benefits from *Bubalus arnee*:

With the help of the CSUWN project, various preservation and work intercessions have been embraced to protect biodiversity, especially the wild buffalo populace in the KTWR. The administration plan of KTWR was at last affirmed in 2010 after a significant stretch. This endorsement has entitled the buffer zone networks to get half of the income acquired by the KTWR for network advancement. There is a reformist progression of sightseers the two local people and outsiders into the holding zone. By 2011, the Reserve has had the option to acquire a sum of NPR 11,75,933 contrasted with the year 2006, where just NPR 395,891 was produced. After the endorsement of the administration plan the income has shot up to NPR 671,097; twofold the figure procured in the year 2006. The diminishing in the income in the year 2009 is ascribed to the outcome of the floods that happened in September 2008, after a 2-km stretch of the Koshi River dike was washed away by the flood bringing about the immense immersion of the eastern stretch of the hold including human settlements and horticultural grounds. The income age is generally subject to the progression of the travel industry accordingly extraordinary secured zones have various measures of income assortment. The test exists for the ensured territories that are asset poor, although they are as significant for preservation as the exceptionally visited zones. One approach to address the asset hole is to make a container store in which income created from asset-rich secured territories could be utilized to help neighboring zones that are asset poor [Khatri 2010].

To lessen crop theft by wild creatures, a sun based fueled electrified barrier has been raised in the high effect zone of the eastern area of the KTWR. This activity has fundamentally diminished the current nearby conflict among the

neighborhood networks and holds the executives. Additionally, with the erection of the electrified barrier, no reports of yield plunder have been accounted for here, especially by wild buffaloes and elephants. Also, supported administration mediations including a network-based antipoaching drive-by activating neighborhood young people, cradle zone networks, nearby instructors, and eco-clubs have brought a positive effect towards the clearing of wild cattle (cows and buffaloes) from the Reserve. The Reserve board with the dynamic help of neighborhood networks has had the option to gather a sum of NPR 128,000 from the punishments by seizing an aggregate of 426 cattle (both buffaloes and cows) from the Reserve. This was the first clearing drive ever directed by the Reserve as it is as yet an exceptionally challenged policy-driven issue. Subsequently, there was a decrease in the quantity of feral and domesticated cattle recorded in the Reserve. Since no wood assets exist outside of the hold there is a significant level of brushing pressure from both wild ones just as homegrown stock. A multipronged approach towards decreasing the group size of the homegrown domesticated animals by supplanting it with a more profitable one along with the advancement of slow down taking care of training would, in the end, lessen the tension on the Reserve.

To address the above circumstance, KTWR has been advancing block plantation along the western limit of the reserve to make a green belt to permit neighborhood individuals to gather grain for their animals, in this manner debilitating unlawful grazing. The blend of elective alternatives of making a utility zone for rotational cows munching and feed assortment supported by a solid law requirement system will at last counterbalance the current pressing factor applied on the hold. Under the aegis of the CSUWN project, a travel industry advancement system has been investigated to investigate the potential outcomes of how to create the travel industry items that could profit neighborhood individuals and to create nearby stewardship towards preservation. Moreover, different business improvement exercises for wetland-subordinate networks, for example, fisheries, poultries, and wetland based green undertaking, vegetable cultivating, have been upheld to improve the financial state of the individuals. The current expansion in the populace doesn't give comfort, as there are various difficulties to the drawn-out endurance of this species. A multipronged approach of preservation and advancement by assembling the buffer zone networks supported by a solid law requirement system would establish an ideal climate to address the current administration issues and concerns identified with assurance and protection. The primary goal ought to be towards upgrading preservation and saddling the side-effects of protection for neighborhood advantage.

5. Why Koshi Tappu area is Buffer zone:

The KTWR has confronted Reserve-individuals clashes since its foundation. The impact of human unsettling influence changes extraordinarily, contingent upon nature and its force. Along these lines, understanding the above circumstance, the Government of Nepal in 2004, proclaimed an encompassing territory of 173.5km² as a buffer zone. This is one of the nation's inventive procedures for participatory preservation, underlining a buffer zone system intended to lessen the unfavorable effect of ensured territories on the occupations of nearby networks and the other way around. The complete human populace of the buffer zone in 2009 was 93,323 from 16,280 family units. As commanded by the Buffer Zone Management Regulations, the cushion zone is qualified for getting a half portion of the income produced by the KTWR for network advancement exercises. The cash got is diverted through client gatherings. These client bunches are shaped at the settlement level and are answerable for the arranging, the executives, and management of the exercises actualized. The Koshi River wanders and goes through the KTWR. The waterway not just shapes the actual highlights of the district yet, in addition, changes the biological system of the zone and profoundly affects the financial qualities of the neighborhood networks of the buffer zone inhabitants [Khatri et.al, 2012]. The Koshi River, which changes its course quickly across years, changed its fundamental course significantly during the storm of 2008 and penetrated a 2km stretch and entered the human settlements through Kushaha Village [Khatri et al. 2010a].

This abrupt move throughout the Koshi River has profoundly affected the actual scene and resulting impacts on human settlement and their farming fields. Enormous parcels of timberland close to Prakashpur Village and fields in the eastern piece of the district were completely washed away. The Koshi penetrate carried untold wretchedness and misfortune to the lives of individuals, of Nepal as well as of India. After the break of the eastern dike, endeavors were made to return the primary channel to its unique course by utilizing many hefty machines and kinds of hardware supported by a solid armada of more than 1000 faculty for a time of more than one year. The Reserve needed to adapt to all the externalities like transitory settlements inside the reserve, the stock of fuelwood and feed, extreme utilization of neighborhood assets by both nearby individuals just as by the development organization that was occupied with the maintenance and support

work of the penetrated bank. Throughout fix and upkeep, six male Arna was moved 5km south of the flood (in Gobargarha Village) from their territory because of the significant level of aggravation. During this period, the reserve needed to endure the worst part of this cataclysmic event. During the time of political flimsiness and strife, all the security posts were harmed and the security workforce was removed and converged inside the hold central command, Kushaha. Subsequently, the law requirement turned out to be exceptionally powerless because of which infringement, illicit brushing, collecting of assets got uncontrolled. The primary danger to the wild buffalo is the kept blending and blending of the wild and the homegrown stocks bringing about hybridization. What's more, because of the Koshi surge of 2008, there were theories of a wide-scale loss of this species. Subsequently, to discover the status, a registration was led mutually by the Department of National Parks and Wildlife Conservation (DNPWC) and the Conservation and Sustainable Use of Wetlands in Nepal (CSUWN) via the square check strategy [Skinner and Smithers 1990]. The exclude was conveyed both by foot and with the utilization of elephants. The evaluation was led in April–May 2009, when permeability was the most noteworthy and water release was at the least. A recurrent tally was accomplished for three back to back days.

6. Complications associated with Bubalus arnee: Poaching is boundless in Nepal, frequently for resource purposes, to enhance either small weight control plans or deficient elective work openings. Ineffectual law authorization and deficient protection mindfulness are contributory variables. At Koshi Tappu, 763 wild creatures were accounted for executed somewhere in the range of 1994 and 1999 involving 683 wild hogs, 65 hoard deer, and 15 spotted deer, of which 81 (76 wild hogs, 3 hoard deer, and 2 spotted deer) were poached in 1999 alone. Wild Buffalo, turtles, and winged animals are likewise slaughtered however no records are kept. Since most poachers and their casualties stay undetected by the Reserve specialists. yearly mortality because of poaching is accepted to be a few times higher than what the records recommend and is one of the fundamental drivers for the exhaustion of the few untamed life species in the Reserve. Poachers use traps, catches, lances, firearms, explosives, and toxins (basic pesticides) to murder focused on species. Indeed, even the first Ramsar Site in Nepal, Koshi Tappu Wildlife Reserve, was made initially for the security of the final populace of Asiatic Wild Water Buffalo and not for the insurance of wetland biodiversity. According to Protected Animal Species Under The National Parks And Wildlife Conservation Act, 1973: The Scientific name of Wild water Buffalo was *Bubalus arnee* changed into Arna as the local name. From IUCN status, it is in Endangered [IUCN Nepal (2004)].

7. Nutritional ecology of Wild Buffalo: Nourishing ecology is valuable for the preservation and the board of imperiled species like Wild Buffalo [Shrestha et al, 2020]. Supplement adjusting is the marvel by which creatures homeostatically manage their admission of nourishments to keep a generally reliable supplement consumption notwithstanding in some cases extensive variety in the dietary synthesis of food things devoured [Simpson and Raubenheimer, 2012]. Subsequently, intraspecific variety in eating routine arrangement because of natural contrasts may not compare to huge contrasts in generally dietary supplement creation. The Wild Water Buffalo is an animal type that has been the subject of escalated the board over the past 60 years and is recorded by the IUCN as Endangered [Kaul et al, 2019]. All through their present reach, buffalo select low-lying alluvial field living spaces [Heinen and Paudel, 2015]. While little exploration has unequivocally contemplated the eating regimen of wild buffalo, taking care of perceptions recommend they are overwhelmingly slow eaters, however, have been noticed rummaging on forbs and peruse, particularly new development [Choudhury, 2014]. In Nepal, wild buffalo were limited to the KTWR until 2017 when a subsequent populace was set up in Chitwan National Park. As we realize that censuses of the KTWR populace have been led irregularly since 1976. These censuses have depicted a normal yearly populace development pace of 3.3% all through that time [Dahmer, 1978; Heinen, 1993a; Heinen and Kandel, 2006; Heinen and Singh, 2001; Khatri et al, 2012]. This development rate is steady with the populace development paces of other huge, enduring ungulates that have sufficient living space and are not dependent upon predation pressure [Clutton-Brock, 1989; Heinen and Paudel, 2015]. The latest enumeration directed in 2018 announced 441 individuals in KTWR's wild buffalo populace [KTWR, 2018]. Females are regularly found in crowds of 13–17, and unhitched male groups have been noticed being included 9–12 individuals [Heinen, 1993a]. [Shrestha et al, 2020] portrayed the wholesome biology of wild buffalo in the KTWR to encourage its preservation and the executives. They utilized multidimensional nourishing specialty ideas to assess the scrounging decisions of free-running wild buffalo during the pre-winter in the KTWR. They recognized plant species that were scrounged by wild buffalo and examined the parts of the food abuse level of their nourishing specialty and assessed the relative recurrence (RF) of graminoids, forbs, and peruse rummaged by wild buffalo. At that point, they

investigated the supplement equilibrium of scavenged species to acquire knowledge of the level of supplement specialization and the acknowledged supplement specialty for wild buffalo in the KTWR. They anticipated that the acknowledged supplement specialty for wild buffalo would be most noteworthy in the extent of carbohydrate energy, moderate in protein, and with the least extent for lipid, with regards to the dietary supplement equilibrium of other Nepalese herbivores [Aryal et al., 2015a; Aryal et al., 2015b, Koirala et al., 2019].

8. Necessity of translocation of wild buffalo from KTWR: Necessity of transufficient genetic diversity of wild individuals or feral backcrossed as suggested by [Heinen & Paudel (2015)] should be represented from a source population of KTWR to the translocated population in the native area such as Chitwan, Bardiya or other appropriate sites [Heinen 2002] in Nepal. Founding genetic diversity of translocated population determined by the number of genetically variable wild individuals, the proportion of diverse pure stocks, those that contribute genetically to the next generation and number and frequency of polymorphic alleles that represent whole genomes of the source population. Translocated populations are mostly small in size therefore they are prone to loss of genetic diversity very rapidly through genetic drift [Frankham et al. 2012]. Genetic assessment of source populations in advance of translocation (pre-translocation) helps to guide translocation plans and informed post translocation assessment or monitoring of genetic diversity in the founders [Groombridge et al. 2012]. In addition to geneticists, active involvement of conservation biologists, wildlife experts, wildlife veterinarians, ecologists, physiologists and local people in the translocation program can ensure longer-term welfare and wellbeing of the re-introduced population.

Selecting individuals for translocation programs, identification of wild individuals through the detailed molecular study of the buffalo population protected in the reserve is a high priority for the Nepal government. Also, understanding the genetic makeup of Wild Buffalo could be used as the basis for genetic improvement of domestic stock. National capacity building to conduct advanced molecular studies should be initiated from collecting blood and faecal samples, creating a DNA reference library, and carrying out genetic research on various aspects such as population genetics, breeding behaviors among different buffalo types, disease dynamics, and food habits of buffalo population in the reserve. [Kandel et al 2019a] presented results of DNA sequence variation in the partial but variable cytochrome b gene among purely wild, feral, and domesticated individuals and prospects for advancing genetic research on Wild Buffaloes inhabiting KTWR in eastern Nepal.

Before embarking on a genetic translocation program for the buffalo of KTWR, Nepal should upscale its laboratory facilities, design population-based advanced genetic research, and take the initiative to build a DNA bank of all possible individuals counted in 2016. The DNA bank, reference DNA sequences and genotype database are crucial for research and conservation efforts, to enhance our understanding of genetic effects of introgression, the study of dietary patterns on different buffalo types and assess the status of pathogens affecting the buffaloes with different genetic backgrounds. Using the same blood samples collected during this study we have reported the prevalence of malaria parasites for the first time in buffaloes of KTWR [Kandel et al. 2019b]. Given the lack of highly technical laboratories and trained manpower in Nepal and the urgency to identify wild individuals reliably, collaborative research with international universities, research institutes and conservation partners on advanced molecular studies are to be jointly conducted. In conclusion, this research sets a baseline to develop well- defined action-oriented strategies that guide the pre-translocation genetic study of wild buffaloes in KTWR and their monitoring through post-translocation genetic studies. Key actions highlighted by [Kandel et al. 2019a] such as collaboration between partners, the establishment of DNA bank of all extant individuals in KTWR, involve experts from different disciplines, upscale and strengthen present laboratories and build the capacity of available human resources for genomic level data management are important steps to be taken by the Ministry of Forest and Environment, Department of National Parks and Wildlife Conservation and its national and international conservation partners for genetic translocation of Wild Buffalo including other threatened species of Nepal.

Quick and complete immersion of the Reserve during storms and successive changes in stream courses pretty much consistently has been the greatest danger to the presence of wild buffalo. The penetration of the eastern bank of the Koshi flood at Kusaha of Sunsari region on eighteenth August 2008, made destruction for untamed life and their territories, individuals' vocation, and government assistance. [Khatri et al 2010] directed to learn the status of biodiversity inside KTWR and its Buffer Zone from March to November 2009 to think of the status of Arna, dolphins, bog mugger crocodile, Swamp francolin (Simitra), and vulture populace and survey the biological status of wetlands. Direct

tally strategy, cut across technique, point tallies, subjective samplings, field perception, and social overview was done to examine the biodiversity status. An aggregate of 219 wild water buffalo, 11 dolphins, 5 bog mugger crocodiles, 52 to 74 Swamp francolin, and 517 vultures. The examined wetlands were modestly dirtied. By and large 42 taxa of benthic macroinvertebrates were recorded. The outcomes were additionally contrasted and a couple of long stretches of information before the flood event. The current outcome demonstrated an empowering populace of key species at the Reserve yet the dangers for preservation stay testing.

Wild buffaloes are intensely reliant on water, invest significant energy floundering in streams or mud openings, and are all the more oftentimes experienced in riverine backwoods, prairies, bogs, and marshes [Roth, 2004]. Wild water buffalo lives together with the hold with exceptionally backcrossed non-domesticated wild buffalo thought to have been delivered in KTWR during the 1950s [Dahmer, 1978]. Presently, the significant dangers to wild water buffalo are loss of hereditary variety because of introgression with homegrown and non-domesticated buffalo, just as dangers from chasing, and illnesses from homegrown animals [Kaul et al., 2019; Kandel et al., 2019b; Flamand et al., 2003]. The number of inhabitants in non-domesticated steers was discovered to be higher than the assessed populace in 2000 [Heinen and Singh, 2001] which could be credited to law authorization and legitimate administration lacking. The act of cross-rearing with wild males is as yet a typical practice [Khatri et al., 2012] in KTWR. A sum of 15 wild water buffalo has been moved in a 30-ha nook on the old Padampur territory of Chitwan National Park (CNP), Nepal [Shah et al., 2017]. Park authority is keeping up the natural surroundings like KTWR by various ways, for example, fencing to shield them from the danger by various sources, cutting the grasses, keeping up water from the Chure territory, building lakes for floundering, setting up view tower for better checking of them however the achievement isn't hundred percent [Shah et al., 2017]. The introduction of three calves is incredible advancement however the demise of 6 individuals is as yet a reality that limits CNP from being another normal territory of wild water buffalo and keeps up its feasible populace [Shah et al., 2017]. In this way, there is a solid need to move a portion of the populace into another reasonable environment. A few analysts have suggested the movement of buffalo into either Chitwan or Bardia National Park (BNP) [Aryal et al., 2011; Heinen, 1993a]. Accordingly, it got important to discover the appropriate living space of the wild water buffalo in the region to be moved in BNP. At this point, it is set up that the utilization of satellite far off detecting and GIS is a viable device for territory assessment [Kushwaha and Roy, 2002]. Subsequently, this investigation endeavors to locate the appropriate environment of *Bubalus arnee* inside the Babai flood plain of BNP utilizing GIS alongside distantly detected information and estimations acquired from the field.

Out of the all-out 108.67 km² of the investigation region (Babai flood plain), the most reasonable living space was discovered to be 8.26 km², the tolerably appropriate environment was discovered to be 100.12 km² and the less appropriate natural surroundings was discovered to be 0.29 km² for movement of wild water buffalo to Babai flood plain of BNP [Thapa et al 2020].

9. Conclusion

Due to the weak management policy of the government of Nepal, the KTWR area is heading, towards its doom. The reserve which is mainly reserved to support the last surviving population of wild buffaloes is not secured over there. The rules and regulations are not enforced strictly. One of the main problems of this reserve is the uncontrolled grazing of the vegetation by domestic cows and buffaloes. The herds of domestic buffaloes and cows graze inside the reserve and reside inside the Tappu for almost the whole of a year until the monsoon season arrives. The local trend of the people has become so worst that they buy herds of domestic buffaloes and cows and just send them to the reserve to service. The exact population of these domestic cattle inside is unknown. For the preservation of wild buffalo in Koshi Tappu Wildlife Reserve, two major problems are identified (a) problem affecting the daily life of the people and (b) the problem created by people by poaching of wild animals, illegal use of forest resources, habitat destruction, forest, fire and river fishing. Information on the surge of 2008 further confounded the issue as the Reserve needed to adapt to all the externalities going from the impermanent settlement, fuelwood and feed supply, extreme utilization of neighborhood assets, and the development and fix work of the dike. Although KTWR gives a significant environment to various jeopardized species, current practices and existing issues represent a genuine danger to the drawn-out protection of biodiversity. On the off chance that we are to deal with the biodiversity and improve the neighborhood work of wetland-subordinate individuals, the whole stretch of the Koshi River from Chatara to Koshi flood ought to be given due consideration and need. Likewise, the current non-domesticated cows ought to be eliminated to make and give enough

space to wild herbivores. Movement of Arna to comparable natural surroundings somewhere else ought to likewise be a need from the administration viewpoint. The Government needs to spend funds on searching for more possible areas of translocation of Wild Water Buffalo.

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Keywords

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