

1. Identification, Location and introduction to the Area

1.1 Name, Location, and Jurisdiction

Bhindawas and Khaparwas wildlife sanctuaries are twins and are man modified wetland eco-system carved out from marshy saucer shaped depressions. The wetlands are situated in the Jhajjar district of Haryana with Latitudinal Range 28°~32' North and Longitudinal Range 76°~32' East. The wetland complex is part of Jhajjar Territorial Range of Jhajjar Forest Division. Bhidawas Lake is spread over an area of 1017 acres. It was declared as a protected area (Wildlife Sanctuary) in the year 1986 under section 18 of the Wildlife (Protection) Act 1972 vide Government of Haryana notification no.S.O.31/C.A.53/72/S.18/8/ dated 07.5.1986 (copy of notification at annexure-1A). Khaparwas Lake was notified as Wildlife Sanctuary in year 1991 vide Government of Haryana notification no A 49/K.A. 53/72/B. 18/91 dated 27-3-1991 (annexure 1B). The physical area of Khaparwas lake is 204 Acre, 2 Kanal & 19 Marla. The crow fly distance between the two lakes is 1.5 KM and by road, it is about 4 KM. Both the Protected Areas (PA's) are habitat to same population of migratory and resident bird population of this area. For this reason, management practices and intervention for both these areas have to be considered together. In ecological terms, the area of two lakes and the intervening agricultural fields with a network of canals (Jawaharlal Nehru canal and its escape canal) and drains (Drain no-8, Bhindawas link drain and Out fall drain) form a composite habitat for the predominantly wet land fauna. The administrative set up for both PA's is also same. For these reasons, both the wetlands have been considered together in this management plan

Bhidawas Lake

Bhindawas Wildlife Sanctuary is a wetland which is the largest fresh water wetland in Haryana. It is situated 80 kms. From National Capital & 15 kms south west of Jhajjar District. Bhindawas wetland eco system is home to thousands of migratory as well as resident birds and is used as a stopover for birds heading towards Keoladeo National Park, Bharatpur due to depletion of water spread area at Keolladeo National Park. Lot of birds are also using Bhindawas Wetland as their resting and rousting site. The periphery of the lake is of 12km length heavily

embanked by earthen bund which delineates the boundary of lake. The top of the bund is motor able with plantations on either side of it. The zone of influence (ZI) outside the boundaries extends up to a distance of approximately five hundred meters away from and all around the peripheral embankment

Khaparwas Lake

The periphery of the lake is heavily embanked by earthen bund. The top of the bund is motor able with plantations on either side of it. The zone of influence (ZI) outside the boundaries is insignificant whereas inside the PA, the ZI extends in whole of the protected area. The local population has tendency to bring their cattle for grazing in the dry area of wetland. Village women stealthily collect fuel wood and occasionally there are cases of illegal felling of trees and their theft.

1.2 Approach and Access.

Nearest Railhead is at Rohtak around 50 Km and Bahadurgarh also about same distance. Nearest Airport (about 75 Km) is at Delhi. The wetland complex can be reached from Jhajjar town via Jhajjar kosli road (Approximately 14 Km) or via Chuchakwas (approximately 20 Km).

1.3 Site's Biodiversity Values .

2 Site's biodiversity values listed, and for major categories, justification provided

Bhindawas wetland is not only valuable for conservation of birds but also serves as a valuable asset in terms of number of services it renders to the society with the details as under:-

I. Environmental Value

The presence of soil organisms and vegetation by capturing water carried nutrients and pollutants result into break down of these pollutants. This water body is therefore is providing ecosystem service of purifying water. It serves as buffer between drought and flood. Being a major wetland, it is the breeding ground for fishes and other Zoo plankton which serve as source of food for water birds.

II. Social Value:

The social value of this wetland include aesthetic, recreational, cultural and spiritual in nature.

III. Ecosystem Services:

The wetland serves as a buffer in between flood and drought. The influence of this water body on surrounding micro climate is evident from the fact that there is enhanced water recharging and lowering of day temperature during the inclement weather of May and June. Purification of water by soil organism and aquatic vegetation result into purification of overall ecosystem of the area. It also serves as habitat for aquatic birds and other terrestrial animals of the area. The water body has potential for major eco-tourism site.

IV. Economic Value:

The water body has a potential of source of medicinal plant. It can be used as major medicinal resource for bonafide use of the people.

2. Background Information & Attributes

2.1 Boundaries

External:

Bhindawas

Boundary of the lake is well defined by the bund encircling it. The ecological boundary from point of view of usage of habitat by avifauna, extend far beyond the physical boundary of the Protected Area. The trees, particularly Acacias, along adjoining water courses (canals and drains) and along the strips of roads leading to PA provide nesting sites. The vegetation in the 10 km radius of the lake will affect the visiting frequency of a lot number of bird species. The vast agriculture fields around the PA are also used by the fauna. There are no reported incidences of conflict of habitat usage by avifauna out side the PA but the blue bulls some times become irritants to farmers.

Khaparwas

Boundary of the lake is also well defined by the bund encircling it. All around the bund is present a wire mesh fence. The ecological boundary from point of view of usage of habitat by avifauna, extend far beyond the physical boundary of the protected area. The vast agriculture fields around the PA are also used by the fauna. There are no reported

incidences of conflict of habitat usage by avifauna outside the PA but the Blue bulls some times become irritants to farmers. Not very far back, like Bhidawas lake, the depression of Khaparwas was also utilized by the irrigation department for storage of flood water. Presently, the depression is not receiving flood water from canals or drains. For this reason, the Khaparwas lake now has developed mesic conditions in most part of the depression. This part of the wetland complex is now more suited for development of nesting heronries and plantation of fruit trees in top story and shrubs and grasses in the middle and ground stories. The water capability of Khaparwas depression creates only marsh conditions. There is not enough water for the swimming birds.

2.2 Soil Texture

The area of Jhajjar District is a part of an digenetic alluvial plain. The sediment consists of sand, silt, gravel and kanker etc. The soil texture varies from sandy to clay having a heterogeneous composition with frequent calcium carbonate layers at shallower depths. The Sahibi river basin in parts of Jhajjar blocks are sandy loam in texture, yellowish and brown in colour. Some area of the catchment of Bhindawas & Khaparwas Wetland is affected by salinity and alkalinity problem due to poor drainage brackish water compact kanker layer below root zone. .

2.3 Terrain

Bhindawas

The protected area is a natural saucer shaped depression. Its water holding capacity has been enhanced with construction of earthen embankment all along its boundary. The lake has an average depth of 11 feet and a volume of 11,187 acre feet (11x1017). However, water level in the lake is generally not more than 3 feet. The contour of terrain shows subtle variations of up to 3 feet. This feature allows different depths of water at different places in the lake. Thus, the water depth in lake actually ranges from 1 feet to 6 feet. This variation allows suitability of habitat for divers, waders and swimmer category of birds. The top of the embankment is flat and motorable.

Khaparwas

The protected area is also a natural saucer shaped depression. Its water holding capacity has been enhanced with construction of earthen

embankment all along its boundary. The lake has an average depth of 4 feet. However, water level in the lake is generally not more than 0.5 feet. The top of the embankment is flat and motor able.

2.4 Climate

The climate of the tract is sub-tropical and semi-arid. The climate is characterized by excessive variation in temperature and relatively low rainfall, which has created adverse conditions for the establishment and growth of tress species.

2.4.1 Temperature

The tract is in sub-tropical zone whose main features are extreme heat during summer and extreme cold during winter. Hot winds, locally called “Loo” blow during May and June. The temperature recorded is as high as 47°C in May, while it drops down to 1°C in January. May and June are the hottest months, whereas December and January are the coldest. The temperature exhibits great diurnal and seasonal variations.

2.4.2 Rainfall

The rains are erratic in respect of volume, place and time. The bulk of the precipitation (about 80%) is received through south-west monsoon from June to September. Due to erratic nature of rain-fall, high rate of mortality occurs in young plantations during dry summer months. Light showers are also experienced during winter months, but the winter rains are more erratic and the average annual rainfall is about (550.768 mm).

2.4.3 Relative humidity

The minimum mean relative humidity varies from 17% during April/May to 95 % during August/September.

2.5 Water Sources

Bhindawas Lake

Water source for Bhindawas Wetland is surplus water from JLN canal and direct rainfall over its water spread area. As this wetland is circumscribed from an

elevated earthen bund, therefore there is no direct surface runoff that it may receive from its catchment area. Other source of water, which wetland receives during rise in water level of Drain no 8 during rainy days. This drain is mainly for the discharge of surplus water from the wetland, which finds way to join Najafgarh drain to carry excess water into River Yamuna. Besides this the pumping of water from the water logged areas to the wetland is another source of water to add in the wetland. Water holding capacity of wetland is 14.9 Mcm. Area of wetland is 4451508 sq.mt & Average Depth in high flood time is 3.35mt.

Khaparwas Lake

Presently the Khaparwas lake receives most of water through direct rains. Khaparwas lake receives some water from Irrigation department through a small channel. has . Most of the part now has mesic conditions and a small part remains as marshy land.

2.6 Status of Flora and Fauna

2.6.1 Flora

Bhindawas

Eucalyptus and Babul (*Acacia nilotica*) have been planted on the inner and outer sides of the bund respectively, by the Forest Department. *Prosopis juliflora* has also been planted and has established itself. In addition, many other tree, shrub and herb species typical of the dry, deciduous scrub area have come up in and around the bund area, and become part of the vegetation List of plant species present in the wetland is as under:-

Typha, Scirpus, Cyperus species, Prosopis species and Acacia species, Eichornia, Hydrilla, Ceratophyllum species, Vallisneria species, Azolla, Spirodela, Wolfia, Lemna species, Spirodela, Wolfia, Lemna species, Spirodela, Phragmites..

. Towards the south end of the lake is a largish patch of Babul which forms a good roosting and nesting site for some species of water birds.

Bulrush (*Typha sp.*) grows on the edges of some parts of the lake. Water hyacinth (*Eichhornia crassipes*) and Salvinia grow as weed in the water body. Drain No. 8 and the escape channel has an abundance of these weeds.

Khaparwas

This lake is devoid of natural vegetation. The vegetation is predominantly eucalyptus plantation and most of it is in multiple rows along peripheral embankment. The bed of lake also has groves of eucalyptus trees. Most part of lake bed now has mesic conditions and it has developed green palatable fodder grasses.

2.6.2 Fauna

The wetlands of Bhindawas and Khaparwas are famous for their wide variety of avian fauna. Besides being a winter roosting and feeding ground for migratory birds, the Babul clumps, the reeds and ground vegetation provide breeding sites for a sizeable number of bird species.

There is sizeable population of fish found in Bhindawas lake. There are large numbers of Reptiles, Bluebills, Jackals, Jungle cats, Wild hares etc found in the area. List of animal/ birds species present in the wetland is as under:-

Dabchicks, Coots, Pochards, Pintail, Common teal, Gargary Teal, Shovelar, Gadwai, Wigeon, Bar headed and Grey Lag Goose, Cormorants, Darters, Herons, Spoonbills, Ibises, White Fronted Goose and Rosy Pelican, Black Neck Stork, Bitterns, Greater Spotted Eagle, Orient white backed Vulture, Black-bellied Tern, Sarus Crane, Painted , Painted Stork, Red-necked Falcon, Neelgai, Mongoose, Cobras etc

Species of conservation significance:-

Endangered:-- Oriental White-backed Vulture, Black-bellied Tern

Threatened:-- Sarus Crane, Dalmation Pelican.

3. History of Management and Present Practices

3.1 General

First Management Plan for the Bhindawas sanctuary was prepared by the Deputy Chief Wildlife Warden, C.L. Sehgal on 25.05.1987, and approved on 29.09.1987, and was valid from 1987 to 1991. Khaparwas is coming to scheme of management plan for the first time in this plan

There after a Management Plan of Bhindawas and Khaprawas Bird Sanctuary was prepared by the Deputy Conservator of Forests, Sh Suresh Dalal, IFS for a period of 2007-08 to 2016-17. A Management Action Plan of Bhindawas Wetland was also got prepared of Bhindawas Wetland as per National Wetland Conservation Programme Guidelines by the department during this period.

Bhindawas Bird Sanctuary is a natural depression but extensively man-modified wetland ecosystem carved out from a marshy saucer shaped depression that collects water from JLN Canal escape channel. No surface run off from the agricultural fields feed the lake. As a result of the canalizing of overflow from RD 310/I JLN feeder and construction of earthen embankments, the wetland was converted into a lake with water levels of varying depths. Although the details of the storage capacity of the lake is known but the depth of water in different seasons and the magnitude of fluctuations in the flow of water from the JLN feeder are not known. The residential time of the water that enters (inflow) into the lake from the JLN feeder and the extent of outflow of the water from the stored water are critical for the functioning of the ecosystem. The quality of water that enters the lake from the JLN canal, stagnant water and the water that leaves the lake, rates of siltation and chemistry of sediments are central to the functioning of the ecosystem.

The earthen embankments around the lake is 10.296 Km in length and serve to prevent the flooding of the agricultural fields from the sorted. But due to heavy seepages, subsoil water levels and surface accumulation of water are common features of the agricultural land of the villages. Eucalyptus plantation along the bunds as well as on the small patches of islands within the lake was developed. Management of the bund, drainage canals, the escape link canal and the marshy depressions outside the bund is also critical for the functioning of the ecosystem.

The extent of diversity in sedimentary microbes and invertebrates, benthos, the insects that feed on vegetation, the aquatic vegetation and avifauna is the prerequisite for evolving short-term and long term management strategies for the sanctuary.

Presently the Khaparwas receives direct rain water only. Irrigation department has discontinued its use for storage of flood water. Most of the part now has mesic conditions and a small part remains as marshy land.

The significant observations are:

- i. The man modified lake-Bhindawas (1017 acres) is unique water body and wetland ecosystem that not only serve as home for over 200 residential and migratory bird species and unique aquatic flora and fauna but also serves as the regulatory vent in the entire drainage and recharge patterns. The water body, if properly restored and managed, have high aesthetic and cultural values and hence can serve as major focal point in ecotourism.
- ii. The entire escape channel, the drainage canal and 95% of the water body at Bhindawas Sanctuary gets choked with *Eichhornia crassipes*. Management of *Eichhornia crassipes* is very important for healthy upkeep of wetland.
- iii. There is drastic diurnal fluctuation in water level of lake making it unsuitable habitat for the growth of aquatic vegetation. In fact it is the fluctuation of water levels that makes lake poorer in species and absence of heterogeneity.
- iv. The extensive Eucalyptus plantations and lack of nutritive herbage, particularly of grasses made it poor habitat for insects and other animals in the low trophic levels. In other words the ecosystem does not possess extensive food web and the trophic structure is also disjointed.
- v. The seepage of salts to the surface has been observed in the dried shallow depressions located outside the lake suggesting that sodification of the sediment and nutrient build up might be taking place. The nutrient levels form the surface run off and the flow of escape channel and stagnant waters might be involved in homogenization of the habitat and extremely poor diversity. This is evident by the luxuriant growth of aquatic weeds.

- vi. The source for water hyacinth is the propagules carried by the waters of JLN canal. The drains are completely get choked with the weed and are frequently cleaned by Drainage Department.
- vii. The ecological status of Khaparwas is to serve the mesic and marshy needs of avi-fauna of the region. It is a satellite and complementary ecological area for the main wetland of Bhindawas. The Bhindawas lake is predominantly aquatic with deficient mesic grassy area whereas the Khaparwas lake is deficient in aquatic conditions but abundant in mesic and grassy areas.
- viii. The two wetlands are perfect complements for each other and there is need to manage the two by developing them on their ecological strengths so that their composite ecology is wholesome for the needs of migratory and resident avifauna of the region. This is a substantial reason for considering the two bird sanctuaries as one unit for management purposes.

3.2 Timber Operation and Firewood Harvests

The PA's were created, primarily for waterfowl conservation and to serve for flood and drainage water management. Commercial harvesting of any kind of forest produce is not permitted from sanctuary area.

3.2.1 Even aged Systems and Uneven aged Systems

Bhindawas

The tree vegetation in this wetland is predominantly plantations of Eucalyptus on the embankment. There is a patch of *Acacia nilotica* on the artificially created mound to the south west of wetland. This grove of *Acacia* serve as heronry. The peripheral shallow areas that remain dry for substantial period have been planted by Eucalyptus by constructing ridges (running mounds) to the height of above flood level. There is occasional occurrence of other species like *Ailanthus*, *Cassias*, *Cordia myxa*, *Azdiracta indica* etc. On the outer slope of embankment is present *Prosopis juliflora*. Within and under Eucalyptus plantations and in *Prosopis juliflora*, standing on the embankment, there is profuse natural regeneration of Neem that awaits opening of Eucalyptus crown in order to grow further. The regeneration of Neem is presently stagnating at a height of about 5 to 6 feet and will not come up unless the overhead crown of Eucalyptus is removed. Neem regeneration inside *Prosopis juliflora* crop is coming up on its own and

opening in this overhead shrubby crop is not required. The *Prosopis juliflora* is providing protection to young regeneration and this species is preferred nesting tree when the shrub develops into a tree. So this species should not be disturbed.

Khaparwas

This wetland has plantations of eucalyptus of varying age groups around the embankments and near to the periphery of bed of lake. Most part of bed has palatable fodder grasses.

3.2.2 Firewood Harvest and Collection

No rights exist in sanctuary area. However, people do collect fallen small wood for fire wood purpose stealthily. Challans issued by forest and wildlife staff serves as effective deterrent and it is not much of a problem. However, the occasional attempts of illicit felling of trees by unscrupulous elements have to be controlled by better protection measures.

3.3 Non Wood Forest Produce (NWFP) Collection

Grass and honey are the important NWFP. However they are not extracted by the department and are left for use of wildlife entirely. There is no habitation inside the sanctuaries. The villages located around the wild life sanctuaries has the population 14289 (as per 2011 census). The villages are Kanwah, Nawada, Reduwas, Shajanpur, Bilochpura, Bhindawas, Fatehpuri, Kunija Koilpuri, Khetawas, Chadwana and Bir Chhuchhakwas.

3.4 Leases

No lease exists inside the sanctuaries.

3.5 Other Programs and Activities

A dense wood terrestrial habitat (to the north of northern inner embankment) and an open wood terrestrial habitat (to the south of southern inner embankment) are being developed at Bhindawas Lake with a view to provide greater habitat diversity. A Nature Interpretation Center has been established which provides impetus to nature education and eco-tourism.

3.6 Forest Protection

3.6.1 Legal Status

The Wetlands were declared wildlife sanctuaries under section 18 of the wildlife (protection) act 1972, vide Haryana Government Notification No. S.O.31/C.A.53/72/S.18/8 dated 07-05-1986 and A 49/K.A. 53/72/B. 18/91 dated 27-3-1991. The area is controlled by wildlife wing of the Forest Department. The embankments and their maintenance are in the charge of the Drainage Department, Haryana.

3.6.2 Hunting

Hunting is not a serious problem in the sanctuaries

3.6.3 Poaching and Other Illegal Activities

The Forest Department maintains a record of offences and illegal activities adjacent areas of the sanctuaries. Perusal of the same indicates that illegal activities don't have significant impact.

Grazing, fodder cutting, use of the lake water for domestic and livestock purposes are some of the common illegal activities. Fuel-wood collection is an occasional minor illegal activity.

3.6.4 Livestock Grazing

There is no habitation inside the two sanctuaries. The population of villages around the PA's is about 14289 (as per 2011 census). The villages are Kanwah, Nawada, Reduwas, Shajanpur, Bilochpura, Bhindawas, Fatehpuri, Kunija Koilpuri, Khetawas, Chadwana and Bir Chhuchhakwas. Cows, buffalos and horses are brought to the sanctuary to graze from adjacent villages. The horses are brought in from the villages of Reduwas and Khetawas. The cows and buffalos are brought in from all villages.

3.6.5 Wild Fires

No instance of wild fires has been reported during the past five years.

3.6.6 Wildlife Health

Monitoring of wildlife health has not been an organized activity so far. This is primarily because these two Pas are looked up to as wintering ground for migratory birds. However, regular visits and vigilance is kept to see signs of bird flu.

3.6.7 Interagency Programs and Problems

- i. Control of the Embankment Around the Sanctuaries.

Currently, the Drainage Department is only concerned with the upkeep of the bund and seeing that the excess water from the JLN Canal flows via the escape channel into the sanctuary lake and out into Drain No. 8. They are not sensitive to the need for a better management of the lake water in terms of improving the situation for birds. For this deficiency, the drainage department is not to be blamed because they are doing their principal duty and it is the duty of Forest and Wildlife Department to disseminate information to them regarding ecological and hydrological needs of birds. Organizing seminars and workshops for personnel in drainage department can easily do it. This kind of brainstorming is necessary to integrate flood control measures with water regulation to satiate the minimum needs of avifauna

- ii. Repair and Maintenance of the Embankment and Fence

At present, drainage department maintains the embankment satisfactorily. This arrangement needs no change. The wire fence is maintained by wild life wing. The fence is frequently broken by people and it need repairs frequently.

At Bhindawas, there are no sluice gates to regulate the inflow of water. It is not feasible also because flood water from JLN has to enter lake uninterrupted otherwise it will flood vast spread of agricultural fields and cause lot of damage. Sluice gate is present at exit of lake into drain no 8. The proper control of this gate is critical to management of hydrology of the wetland. Since control of the embankment and water regulators is under the Drainage Department, the wildlife wing will have to collaborate with them in best possible manner.

3.7 Tourism

Due to absence of rail connectivity and not very good condition of roads leading to the sanctuary, tourism has not developed. The visitors to the sanctuaries are departmental officials of forest and drainage department and few individuals/NGOs who are serious nature students and bird watchers. To accommodate these visitors a two room rest house is maintained by wildlife wing.

3.8 Research Monitoring & Training

3.8.1 Listing of available Scientific Resources, Reports pertaining to the Wetland

1. Surface water quality assessment of Bhindawas Lake (Haryana, India) using multivariate statistical techniques—Ridhi Saluja and J.K.Garg, University School of Environment Management, Guru Gobind Singh Inderprastha University, Sector—16C, Dwarka, Delhi, India (RS,JKJ), 2014

2. Gupta R.C.Parashar,M.,& Kaushik,T.K. (2011). An enquiry into the avian biodiversity of Bhindawas Bird Sanctuary in Jhajhar District in Haryana State in India. Journal of Experimental Zoology, India,14(2),457-465

3.8.2 Training

The staff posted at wildlife sanctuary is normally trained in general principles of forestry and to some extent on wildlife at Forest Training School, Pinjore. Only few staffers have under gone specialized training in wildlife. There is need to impart specialized training in Wildlife Management to the personnel. In this regard, there is need for collaboration between Forest Department, Haryana and premier Institute of India, like Wildlife Institute of India, Dehradun, Forest Research Institute, Dehradun etc.

3.9 Wildlife Conservation Strategies and Their Evaluation

- a. Mechanical removal of water hyacinth form Bhindawas lake, escape channel and drainage canals and utilization of the weed as paper pulp, biogas production, feed and compost.
- b. Prevention of the entry of the weed into water body by using floating mats all along the escape channel and/or on the JIN canal at the point of escape.
- c. Assessment of biodiversity is the key for understanding the functioning, restoration and monitoring of the ecosystems.
- d. Analysis of the hydro-geological aspects and biogeochemical cycles for evolving strategies for effective and efficient manipulation of hydrological regimes through creation of satellite wetlands in and around the lake that serve as corridors and enhance the landscape diversity.
- e. Creation of a mosaic of habitats through appropriate manipulation of water levels, soil microbes, invertebrates and aquatic vegetation.

3.10 Administrative Set up

Both the bird sanctuaries are directly under the administrative control of Divisional Wildlife Officer stationed at Rohtak. At sanctuary head quarter there is one post of Wild Life Inspector & one post of Sub Wild Life Inspector. Two sanctioned posts of wildlife guards and two of group-D employees exists. The Deputy Conservator of Forests, Jhajjar is ex-officio wildlife warden.

3.11 Communication

There is a wireless base station at Bhindawas lake and it is connected to Divisional head quarter.

3.12 Key Issue/ Threats/ Problems

Following problems/Key issues have been identified for Bhindawas wetland for identifying the elements for preparation of management Plan

1. Weed infestation

At present the wetland is under threat from excessive weed growth of water hyacinth and imbalance of water levels in the wetland. The major threats being faced by the wetland are weed infestation, Loss of habitat for Avi-funa.

2. Eutrophication
3. Ecological Succession
4. Deterioration in water quality
5. Water Logging in Adjoining Areas
6. Salinity in Peripheral Agriculture Land.
7. Lack of proper connectivity of Adjacent villages
8. Biodiversity Degradation
9. Inadequate facilities & Infrastructure for eco tourism.

4. The Protected Area and the Land-use Status

4.1 The Existing Situation in the Zone of Influence

Bhindawas lake

The embankment all around the Protected Area prevents encroachments. Out side the embankment is present a mesh wire fence. The villagers for making passage for themselves and their cattle occasionally damage this fence. The impact of wet land on the surrounding agriculture land extends up to about 500 meters away from the embankment all around due to seepage of water across the embankment from the lake into the agricultural fields. This leads to water-logging and secondary salinization in the agricultural fields resulting in low agricultural productivity. This is the main grudge that local people have against the sanctuary.

While the people largely maintain that the bund has helped in flood control, the villagers of Chadwana and Shahjahanpur do not approve of it as they feel, it has increased water logging in their villages. There is also the feeling among some villagers that malaria had increased since the building of the bund and the impounding of water in the jheel. However, most other villagers feel that malaria had always been there and has no connection with jheel.

The villagers do not regard birds as being uncontrollable pests, neither they grudge the fact that the sanctuary is a protected area for the birds. There are no rights of the villagers in these sanctuaries. However, the villagers who had lost their land to the building of the lake even now feel that they have a right to it in terms of water and grazing their livestock.

The villages in the adjoining areas of the two sanctuaries are the Kanwah, Nawada, Reduwas, Shajanpur, Bilochpura, Bhindawas, Fatehpuri, Kunija Koilpuri, Khetawas, Chadwana and Bir Chhuchhakwas.

All the villages are revenue villages of Tehsils Jhajjar (Jhajjar District.). They have a total population of 14289 (as per 2011 census). Their distance from the sanctuary varies: some villages immediately adjoin the sanctuary.

Khaparwas Lake

The embankment all around the Protected Area prevents encroachments. . As this protected area has lot of green grass of fodder value and mesic edaphic conditions, a large number of cattle come here for grazing.

History and Conservation Tradition

Surrounding Villages are between 150-500 years old, according to the villagers. The older villages include Bilochpura, Fatehpuri and Kanwah.

A certain conservation tradition seems to exist in most of the villages. The Peafowl, Black partridge, Black buck, Nilgai and Hare are revered. In the village of Khetawas, the Saperas (Snake charmers) also revere snakes – they claim that they release each snake after having kept and displayed it for a short period.

Political

Each village has its own Panchayat. The sarpanch along with the panchayat is responsible for decisions taken in the village and issues regarding it.

Social

The villagers are all Hindus, except for one Sikh family in Bilochpura. The people are largely vegetarian, though meat, fish and chicken are eaten now and then. The Hindus belong to 21 castes. Traditionally they are :

Ahir (Yadav)	-	Cattle rearer and farming
Bania	-	Trader
Bavriya	-	Nomads and hunters
Brahmin	-	Priest
Chamhar	-	Leather worker
Dhanak	-	Weavers
Gujjar	-	Pastoralist and Landowner
Harijan	-	Field labourer and scavengers
Jat	-	Landowner agriculturists
Khati	-	Carpenter
Kumhar	-	Potter
Lohar	-	Ironsmith
Maniyar	-	Bangle seller

Nai	-	Barber
Neelgar	-	Dyer
Sapera	-	Snake charmer/Horse breeder
Sonar	-	Goldsmith
Valmik	-	Herder

There is a definite partitioning of castes as is reflected in their housing clusters, and to a certain extent their occupations. Most people however are agriculturists. Presently even people from the lower castes own land, though on a smaller scale when compared to the traditional landowners. There are Government servants across all casts.

Economic Activities

Agriculture and farm labor are the chief occupations. Each caste also practices its traditional profession to a certain extent.

Agriculture

Wheat (*Triticum aestivum*) is the main crop grown. The following crops are also cultivated :

Sorghum (Jowar)	<i>sorghum Sp.</i>
Millet (Bajra)	<i>Pennisetum typhoides</i>
Chick pea ("Channa")	<i>Cicer arietinum</i>
Mustard ("Sarson")	<i>Brassica nigra</i>
Fenugreek ("Methi")	<i>Trigonella foenum-graecum</i>
Hops ("Jo")	<i>Humulus lupulus</i>
Onion	<i>Allium cepa</i>

The fodder crops cultivated in the villages are :

Cluster bean ("Guaar")	<i>Cyamopsis tetragonoloba</i>
Chicory ("Kasni")	<i>Wichorium intibus</i>
"Birsa"	<i>Wendlania exserta</i>

The agriculture in these villages is typical of the Green Revolution, involving use of chemical fertilizers like Urea and DAP (Diammonium phosphate) and pesticides like Chlorpyrifos / Aldrin, BHC, DDT, Endosulfan, Malathion, and 2, 4-D

and BHC are often mixed with seeds while sowing. The nearest agriculture extension center is in Jhajjar.

Water

The Villages are all situated in low lying areas and are prone to water logging. Tube wells, wells, hand pumps, and storage tanks are the sources for water supply. Some villages have their own ponds (Chadwana, Fatehpuri, Kunjiya).

The villages of Bilochpura, Chadwana, Kanwah, Nawada, Redhuwas and Kunjiya have water shortage because of a lack of adequate water supply, and more importantly the fact that the water in many of the tube wells and wells has become brackish (the reasons for this are unclear). Hence, there is a great dependence on the sanctuary for water for domestic and livestock purposes, and in the case of Kanwah for irrigation as well.

All the villages have a normal drainage pattern, with water logging in some pockets especially on land immediately next to the bund. Shahjahanpur is surrounded from three sides by bunds and thus is more prone to waterlogging.

Alternative suggested by the villagers to overcome the water problem included improving water supply (pipelines, storage tanks, and making water supply from the sanctuary tube well operational). They also said that the reason for the water becoming brackish needed to be investigated.

Grazing / Fodder

Livestock (cows, buffalos, horses) from all the villages is taken to the sanctuary to graze. Graziers from Bilochpura Chadwana, Kanwah, Kasni, Kunjiya, Nawada and Redhuwas were encountered more frequently than the other villages.

Fodder is also cut from the sanctuaries and head loads are taken out. Usually, it is the women who do this job. Each head load weighs about 25 kg. Fodder is cut all the year round, but the peak season is in summer (April to July)

Fodder is also provided from the villages. Crop stubble, fodder crops (Cluster bean, Chicory, and "Birsa"), Mustard oil cake, and "Sathi" "Salvia plebeia), a succulent herb, are all used as fodder. Most villagers also stall feed their cattle on a regular basis. In Fatehpuri, hay is bought from the market to supplement fodder supply.

Energy

All the villages are electrified. Electricity is used to run water pumps, and for domestic use (light, fans, T.V./radio). Supply varies from being very irregular to fairly regular.

The chief sources of fuel for heating in winter and cooking are wood, dung cake, dried stalks of mustard, and in some villages (in a small number of households), electric heaters and LPG.

Fuel wood is almost usually collected from the villages itself by lopping branches and collecting dead wood. The trees species used as fuel wood are Babul (*Acacia nilotica*), Eucalypt (*Eucalyptus sp.*) Jungli Jalebi (*pithecellobium dulce*), Kikar (*Prosopis Juliflora*), Neem (*Azadirachta indica*), Sheesham (*Dalbergia sisoo*), Siris (*Albizia Sp.*) and certain other *Acacia* species.

4.2 Dependence on Bhindawas Wetland

The entire economy of the villages outside the PA is based on agriculture and dairying. The basic needs of local communities residing in the villages adjoining the PA are fodder, fuel wood, and small timber, thatching material, non-wood forest produce, employment opportunity for unemployed youths etc. Each caste also practices its traditional profession to a certain extent. The adjoining communities are not directly dependent on the wetland. However it appears that the wetlands have its indirect impact on the agricultural land in terms of increase in salinity and water logging in the adjacent areas. It appears that the salinity of the soil and poor drainage system may affect the crop yield, the water quality and health of the people, which has negative impact on socio-economic status of the area.

4.3 Current Eco-development Activities

Developmental works like repair of roads and laying of roads has been taken up in these villages by the development department. Forest department is supplying potable water to village Kanwaha from the pump house installed in protected area. Literacy of children is being taken care by education department . Regarding the problem of water logging and secondary salinization of agricultural land due to across embankment seepage leading to very less to nil productivity of agricultural land, forest department implemented a bio-drainage project on agriculture land It

has been put to productive use and the bio-drainage plantations of Eucalyptus are bio- pumping excess water into atmosphere. This will help in restoration of soil productivity besides meeting the requirement of fuel wood and small timber to the local population. However, in the project model, double rows of Eucalyptus were raised on ridges that were 25 meters apart. Experience shows that in future efforts the distance between the ridges should be reduced to 10 meters in order to optimally utilize the land. The cost incurred by Government in bio-drainage project has resulted in following benefits to the sanctuary:

- a) The beneficiaries no more look at the protected area as causative agent for damaging their agriculture lands i.e. the grudge factor is being taken care of.
- b) The local availability of fuel wood and small timber from bio-drainage plantations will reduce pressure on protected area
- c) Microclimate of area around PA is improved.
- d) One time expenditure on bio-drainage plantations will continually give benefits without any further investment for approximately 25 years as Eucalyptus is a good coppicer for at least two rotations.

5. The Existing Situation in the Zone of Influence

5.1 The Vision

Wildlife sanctuaries of Bhindawas and Khaparwas form a very dynamic but fragile ecosystem. It is a man-modified system and requires regular intervention in the form of a well thought out management programme.

5.2 Objectives of Management

- i. To maintain the ecological seral stages of this ecosystem for avifaunal diversity in particular and others in general by improving the habitat in an around PA's to attract more and more species of birds and facilitate breeding of local and migratory birds.
- ii. To provide an enriching wilderness experience and visitor satisfaction through conservation education and wildlife interpretation programmes by developing the place for the purpose of eco- tourism to provide recreation and education to the society.
- iii. To provide site specific, eco-friendly package of measures to reduce dependence of local communities on protected area resources by mitigating the effect of needs of local people by way of eco-development works.

5.3 Problems in Achieving Objectives

5.3.1 Bhindawas and Khaparwas lakes are situated in an area where annual rain fall varies from 10 to 40cm. Thus, it falls under semi desert climatic conditions. There is no assured supply of water to maintain certain minimum level of water in the lake. The lake is used to store excess water from nearby JLN Feeder whenever power failure occurred. Now a days frequency of such failure has reduced. However, maintaining water level in the lake is the biggest problem.

5.3.2 The bunds of the lakes are planted primarily with Eucalyptus trees which do not attract many species of bird. They are also not suitable for nesting purposes. The vegetation of semi desert biotope is absent from the bund of the lake and adjacent areas, which reduces the concentration of local arboreal birds.

5.3.3 The bed of the Bhindawas lake is almost flat with variation hardly of 2 feet which means there are no resting places for the birds in between. There is also shortage of mounds and trees within the lake. Due to absence of

mounds and trees thereupon heronries or nesting sites of large number of species could not be developed.

5.3.4 There is absence of sandy banks due to which large numbers of birds do not visit the lake as frequently as the local ponds in some nearby villages.

5.3.5 The problem of water hyacinth invading the Bhindawas lake area is also acute. Due to this water hyacinth problem the area that can be used by many ducks effectively reduces. Water hyacinth (*Eichhornia crassipes*) drifts into the lake along with the water released from JLN canal escape. It is a very fast growing weed and grows in geometrical proportions. If not removed promptly it chokes the water bodies. Its manual removal after continuous monitoring of its presence is done to counter its invasion.

5.3.6 Absence of Weedy marsh around the lakes cuts down the probability of nesting of large number of birds.

5.3.7 Grazing domestic cattle in the lake area by the local villagers disturb the birds and thus reduce the chances of breeding in and around the lake. Regular census of the feral cattle is necessary to assess the pressure of the cattle on the biotic resources. Grazing cattle damage young plantations. For this reason the plantation efforts have not yielded desired results so far.

5.3.8 The vicinity of Bhindawas lake PA is highly degraded due to seepage from the lake resulting in waterlogging and secondary salinization. The degradation extends up to approximately 500 meters away from the embankment all along the periphery. Thus the intervention is needed in about 800 hectares of agriculture land adjoining PA.

6. The proposed Management Strategies.

6.1 Critical Issues requiring management interventions and their justifications.

Following critical issues have been identified for Bhindawas wetland which needs to be taken care during Management Plan.

1. Weed infestation
2. Eutrophication
3. Ecological Succession
4. Deterioration in water quality
5. Water logging in Adjoining Areas
6. Salinity in Peripheral Agriculture Land
7. Biodiversity Degradation
8. Lack of Tourism Facilities & Infrastructure.

6.2 Objectives of management plan.

The Major objectives of management plan are

- Sustainable conservation and management of Bhindawas wetland
- To suggest in situ and ex situ conservation and remedial measures for conservation of lentic ecosystem and protection of biodiversity.
- To explore the possibility of eco-tourism, research & training for bird watches, researchers and visitors to observe natural areas that conserves the environment.
- The Management Plan should comprise detailed methodology which should be detailed enough to prepare a detailed Project Report.

6.3 Intervention Proposed for improve the existing socio economic status.

Following are interventions are proposed for improve the Socio-economic of village community.

1. Strengthening of bunds will prevention of water logging of agriculture fields adjacent to the wetland that would generate the possibility of land utilization of agriculture
2. Prevention and control over soil salinity through various interventions will improve the soil fertility and making saline land utilizable.

3. Promotion of organic farming in the catchment area would reduce agriculture capital investment and reduce the harmful effects of chemical fertilizers
4. Promotion of organic farming leads towards sustainable agriculture practices.
5. Promotion of Eco-tourism will increase the employment opportunities for local people.
6. Public awareness leads the awareness among the people for environment, water and biodiversity conservation.

6.4 List of activities to be prohibited is provided

Being a Wildlife Sanctuary, all the activities which are prohibited are not permitted. The activities which are prohibited include solid waste dumping, Handling or storage/disposal of hazardous substances, Construction activities and Setting up new industries.

6.5 List of activities to be regulated is provided

The following activities are regulated:

- i. Impoundment/ diversion or any other hydrological intervention.
- ii. Harvesting of resources (living/ non-living) only for bonafide use.
- iii. Grazing.
- iv. Discharge of treated sewage/effluent/waste water.
- v. Construction of boat jetties, facilities for temporary use.
- vi. Aquaculture, agriculture and horticulture activities outside the wetland boundaries.

7. The Descriptions.

7.1 Boundaries

A peripheral earthen embankment clearly demarcates the external boundary of both the sanctuaries. These also serve as fair weather motor able road. The internal boundaries are well defined in Bhindawas lake by the existing network of earthen bunds(Map). However, as far as management of habitat for the avifauna is concerned, the ecological boundary extends much beyond the physical boundary of the protected areas. The vegetation in the 10 km radius of the lakes affects the visiting frequency of a lot number of bird species.

7.2 Zonation

The PA complex is to have four zones for the purpose of achieving the objectives of management. They are

- 1 The Core Zone
- 2 The Buffer Zone
- 3 The Eco tourism Zone
- 4 The Satellite Zone

The 'Core Zone' and 'Tourism Zone' collectively form Bhindawas bird sanctuary. Khaparwas bird sanctuary is entirely assigned to 'The Satellite Zone'. The Buffer Zone consists of villages that share boundaries with the PA.

7.3 Zone Plans

7.3.1 The Core Zone - The core zone consists of aquatic and marshy area of Bhindawas wetland. The zone comprises of the whole of the PA area the excluding the area demarcated as administrative cum tourist facility zone and the embankment / bunds. The zone would be the undisturbed zone and only be managed sustainably for better habitat for avi-fauna.

7.3.2 The Buffer Zone - The Buffer Zone consist of an area of villages that share boundaries with the PA. The villages are Kanwah, Nawada,

Reduwas, Shajanpur, Bilochpura, Bhindawas, Fatehpuri, Kuniya Koilpuri, Khetawas, Chadwana and Bir Chhuchhakwas. Most of it is privately owned agriculture area and a small area along government owned canals, drains and roads is protected forest where Forest Department has done tree plantations. This tree cover is used by birds for nesting and provides niche opportunities. This protected forest area in buffer zone will be directly intervened by management in consultation with territorial forest division authorities to ensure protection of trees. It will be ensured that at least two good SNAGS per KM of strip forests are always retained in the Buffer Zone. Any future plantations in Buffer Zone by way of gap filling or otherwise will be with the objective of improving the habitat of birds and choice of species for plantations will be made accordingly. Some of the suggested species are: *Mitragyna parvifolia* (kadam), *Syzygium cumini* (jamun), *Ziziphus mauritiana* (Ber), *Capparis sepiaria* (heens), *Prosopis spicigera* (remjha), *Ziziphus nummularia* (ber), *Acacia nilotica* (babul), pharans and *Ficus* species like gular, peepal etc. Mixed species plantations are to be preferred.

- 7.3.3 The Eco tourism Zone - The peripheral embankment all around Bhindawas PA will be used for the tourism purposes. Administrative cum tourist facility area that includes office premises, watch towers on bund, interpretation center, research, education and training centre are also to be in this eco-tourism zone to be used by the visitors

Above concept of zoning is mainly for management of the Sanctuary area and is not overlapping the provisions underlined in the Eco Sensitive Zone notification approved under EPA 1986.

Eco-restoration Area - The Eco-restoration area consists of saline upland areas in the Bhindawas PA and slopes of peripheral embankment/inner bunds. Creating vegetative cover suitable for bird needs and aesthetic looks for tourists will develop these areas. Presently most of the trees are Eucalyptus plantations. Adopting following working principles will gradually phase out the Eucalyptus:

- 1 *Eucalyptus will not be planted in future plantations.*

2 *Under the Eucalyptus, plentiful of Neem has come up by natural regeneration. The seed for this natural regeneration probably came with bird droppings. In early stages Neem is shade lover and has developed under Eucalyptus up to a height of 4 to 6 feet. After this stage, the plant is light demander and cannot grow further under the shadow of Eucalyptus. For this reason it is now stagnating in growth which is adversely affecting its health also. This is the time for management intervention and there is urgent need to remove overhead Eucalyptus where ever Neem is present in ground storey. The felling of Eucalyptus has to be very technical and precise so that damage to undergrowth of Neem is minimum. Removal of Eucalyptus will be under personal supervision of officer of rank of at least RFO..*

3 *All future plantations will be with species preferred by birds and are aesthetic from tourist point of view. Suggested species are Barringtonia, Mitragyna parvifolia (kadam), Syzygium cumini (jamun), Ziziphus mauritiana (Ber), Capparis sepiaria (hess), Ziziphus nummularia (ber), Acacia nilotica (babul), and Ficus species like gular, peepal etc.*

7.3.4 The Satellite Zone – The whole area of Khaparwas Bird Sanctuary is assigned to this zone. The management objective in this zone will be to makeup for the deficiency of terrestrial habitat in Bhindawas Bird Sanctuary. While the deepest part will be retained and developed as a small marsh, rest of the area will be developed for creating tree groves and areas with tall grasses. The area of marsh will be increased by installing two tube wells. This will provide diversity of habitat and will create conditions to support greater diversity of avifauna. In the available gaps of existing plantation of eucalyptus on the outer embankment, Acacia, Azadirachta and Ficus species will be planted for providing nesting facility and fruit to the birds. The bed of lake will be developed by planting water logging resistant species like Barringtonia, Terminalia arjuna, Syzygium species etc. Mosaics of shrubs will also be created to provide adequate shelter to the shrub dwelling birds.

7.4 Theme plans

7.4.1 Habitat Management

7.4.1.1 Water Management

Water is the most important requisite of PA ecosystem. The four factors vital in the management of water in the wetland area: -

1. The quantum of water
2. The entitlement of water
3. The duration of dry period

The variations in these four factors effect the annual cycle of events and the stabilisation of the ecosystem.

1 The Quantum Of Water

Bhindawas lake has an average depth of 2.0 meters. It gets water spilling over from the JLN Canal. The water in the lake never reaches maximum capacity since most of it flow out into Drain No.8.

The canal is about 6 Km to the west of the sanctuary boundary at Chadwana, and is connected to the lake via an escape channel. This happens when the electricity at the JR Pump House 1 on the JLN canal fails, and water is not pumped up a height of 12.74 feet to continue on to Sahlawas, or during the monsoons when the canal carries an excess volume of water due to the discharge from the Yamuna and is used to supply irrigation water to the surrounding villages. The water enters the lake area and spreads. It makes its way out through the out-let in the embankment and flows directly into Drain No.8. There is no monitor at the points of entry or exit. The Drainage Department sees the lake only as flood control device and does not feel the need to do so.

2 The entitlement of water

Since the entire water management is dependent on the rainfall and availability of electricity on JLN canal lift, it is difficult to keep control on the time of flooding the area. Moreover, the water in lake is entirely on considerations of flood control measures and drainage requirement and it will not be wrong to say that its availability for birds and other wild life is only by default and not by design for all practical purposes. This results in frequent occurrence of pinch periods when there is no water in the wetland and the lives

of birds and other wildlife forms, dependent on the wetland comes under severe stress and even mortalities may occur.

3. The Duration of Dry Period

Traditionally the water dries up during May & June except for the deeper parts of water body. The dry marshes & pools present during this period are biologically significant. Availability of large number of fish and other food items in these pools attract a large number of piscivorous birds. These birds begin to breed immediately with the onset of monsoon which shows the food abundance in the deeper water bodies and acts as the ultimate factor for breeding. Apart from this the summer flooding also attracts large flocks of local piscivorous birds like Storks, Spoonbills, Egrets and Cranes. The periodic drying of these marshes help maintain the water-chemistry to the desired level. Periodic flushing and drying also helps in getting rid of some of the undesirable vegetation, salts and chemicals. Hence no attempt should be made to retain water in the entire marshland during summers.

A drought year (say once in 5 years) also helps in removing extra biomass of grasses and other undesirable vegetation. An ideal wetland must have at least 50% of open water body & the year of good rainfall succeeding a drought year provides these ideal conditions.

Therefore, the following water management is prescribed for Bhindawas Sanctuary:

1. The water level of wetland varies from 0.5 meter to 3.5 meters. There is imbalance of water depth through out the water body resulting into dry shrub dominated areas as well as non forested peat lands and seasonal fresh water Marsh areas. Such area which is having water depth of more than 2 meters is not utilized by water birds on account of reduced fish availability and reduction in Zoo Plankton in the water body. Therefore, there is a need to rehabilitate the wetland by creating different water zones so that the water birds of different species can use such zones for nesting, roosting and feeding purposes.
2. A dumpy level survey needs to be done at 0.25-0.5 M contour interval. The exercise may be undertaken by a professional agency.
3. The sluice gates at exit of lake into drain must be maintained, painted and greased in the months of May/June every year.
4. The PA authorities along with the district administration should ensure timely diversion of water into gates. They should also ensure timely release of water to

PA. The ideal time for the release of water to wetland is between 1st April to 10th April and then 1st Oct to 10th Oct. The Government should intervene if required to ensure that there is timely and steady supply of water to the PA.

5. It should be ensured that the total quantity of water required for flooding the PA is available. The optimum quantity of water required for the PA is 1500 acre-feet.
6. During the period of intake of water, strict vigil should be kept to prevent breach of escape canal (by local people to divert water in the fields) or obstruction (from floating vegetation and other solid material).
7. In order to provide shelter and adequate aquatic habitat for fish the existing deeper water bodies would be maintained and water would be made to remain in these depressions even during summers.
8. All the eroded earthen embankments of the PA would be immediately repaired. Repair work must be taken up during summer months (April - May). Provision of funds during April- May must be ensured.
9. Deep water bodies of about 50 acres where appropriate may be created at 2-3 places in the Bhindawas PA, which may act as fish reservoirs during the peak summers and also serve as water holes for the mammals.
10. In case of drought, shallow open wells would be kept where there is a possibility of getting sweet water. Water would be pumped out and its quality tested regularly and recorded in order to ensure water of desirable quality only
11. In order to maintain the status of the sanctuary no water should be allowed from the adjacent areas to be pumped in.

Vegetation Management

- 7.4.2 The vegetation of PA's is not a climax community. It is very important to control the aquatic macrophytes in order to maintain optimum habitats for various species of waterfowl and animals. An ideal wetland must have at least 50% of the water body as open areas i.e. without any vegetation and other weeds. This calls for a balanced approach in the management of the habitat. The basic theme behind the proposed management would be to develop the entire lake and surrounding areas in such a manner so as to attract different species of birds in large number. Besides that, attracting people for eco-tourism to enhance their

understanding towards the conservation of natural heritage is also part of its theme.

To achieve these goals a part of Bhindawas lake will be separated and planted with natural trees and shrubs and most of the Khaparwas lake will be developed as mesic terrestrial habitat with a small marsh. It will not only satiate the visiting tourist with its lush green appearance but it will also help in conserving the local bio-diversity and attract avian fauna other than water birds in large number. Shrubs and grasses should be planted adequately in the terrestrial part of habitat to provide shelter and breeding areas to ground dwelling birds. Availability of habitat diversity is directly related to diversity of migratory and resident faunal populations.

The following prescriptions will be carried out in the PA's:-

1. A balance between open grass area and open water bodies will be maintained. This will be achieved by the following management practice.

A. Surface scraping using tractors

Light harrowing and disc ploughing the dried area. The grass uprooted can be gathered into heaps and burnt. It will allow the water areas of unnecessary settling of the grass layer on the surface. These operations will be carried out very year but on rotational basis, so that every block is maintained in a rotation of three years.

Surface scraping is possible during the months of April and May. Requisite funds must be made available at this time of the year for the operation.

B. Controlled burning

During the months of May-June, the dried Eichornia on dry patches must be scrapped in heaps and subjected to control burning.

- C. The mounds created in the bed of marshes as a result of scraping should be retained there because of the following reasons:
 - i. They provide an ideal resting and roosting habitat for shore feeding birds like storks & herons as well as for ducks and geese.
 - ii. Resident ducks like the Spot billed Duck and at times the Lesser Whistling Teals and Cranes also use these mounds for nesting.
 - iii. They are ideal for restocking the babool trees in the nesting colonies. Trees in the old colonies dry up due to the acidic nature of the droppings of birds.

- iv. Resting habitat for Nilgai, Sambhar and Spotted Deer fawns. Mounds provide protection to the ungulate fawns from predators like stray dogs, hyenas and jackals.
- v. No effort should be made to remove the dead and fallen trees from the marshes because they provide ideal nesting and perching sites for birds like cotton teals, barbets, and woodpeckers.
- vi. Eradication of unwanted weeds of water hyacinth (*Eichhornia crassipes*, *Jalkumbhi*) and *Salvinia*.
- vii. Repair of the mounds is to be undertaken regularly so that there is no loss of trees.

Eichhornia crassipes creates monospecific stands in slow moving & stationary waters.

Native to the Amazonia, South America, it has become a threat to the aquatic ecosystem of PA. Dense mats of *Eichhornia crassipes* shade the lower depths of the water bodies, reducing photosynthetic activity and hence the oxygen content of the waters. Phytoplankton growth is suppressed, severely damaging dependent food chains. Fish yields are affected and species diversity decreases drastically while siltation increases as the plant act as silt traps.

Water hyacinth is a very fast vegetative propagator. According to experimental calculations each plant may multiply into 4000 to 12000 plants per season (Irrigation and Power Research Institute 1993). It is brought to the PA with the inflow of water from outside. It has to be eradicated on a continual basis each year on a day to day basis from the wetland blocks. Delay in the removal causes excessive growth, which becomes very difficult and expensive to eradicate. The efforts made till date should be maintained by its regular removal.

Drought years should be used to remove the water hyacinth either by mechanical means or by deploying labor. The weed can be used to make vermin-compost or raw material for biogas. Biological controls like the weevil and mites may be experimented with.

Removal of other unwanted growth like *Ipomea carnea*, *Typha angustifolia* should be done at regular intervals, as the situation demands so that their spread is limited.

7.4.3 Protection Plan

This unique man made ecosystem is surrounded by a rural landscape on all sides. The villages adjoining areas of the sanctuary complex are as under:-

Bilochpura, Bhindwas, Bir Chhuchhakwas, Chadwana, Fatehpuri, Kanwah, Kasni, Khetawas, Koilpuri, Kunjiya, Nawada, Redhuwas, Shahjahanpuri and Khaparwas.

The entire economy of the villages outside the PA's is based on agriculture and dairy. Villagers had access to the PA resources before the area was declared as a wildlife sanctuary.

The basic needs of local communities residing in the villages adjoining the PA's are fodder, fuel wood, small timber, thatching material and minor forest produce that are partially met from the PA. Maintenance of the boundary embankment and wire fencing will reduce crop damage by blue bull and also improve the protection of the wild animals, birds and the habitat as a whole.

Breakage of embankment for access, collection of fuel wood and non-wood forest produce, extraction of grass, the occasional pilferage of timber, clandestine grazing of cattle, illegal fishing, illegal collection of honey, and use of the PA as a thoroughfare are among the common violations that people are and be penalized for.

7.4.4 Protection from Grazing

Grazing is prohibited inside the PA. The breaches in the embankment and wire fence are the main entry points of the village cattle. People of some adjoining villages mostly create the problem. They have more of livestock and less of grazing ground and they are all the time on the lookout for some way to put their cattle inside the PA. The cattle (Cows) that are smuggled inside and mix with the feral cows and graze inside, thereby increasing food and water competition for the ungulates. This is to be checked and therefore the following management is prescribed

- (i) Regular maintenance of embankment and boundary fence should be ensured.
- (ii) The local staff can conduct constant hours patrolling along the peripheral path. Keeping record registers can monitor the guards at the post. This requires sufficient staff working at different duty hours. This would reduce the incidences of wall breaking and forest offences.

7.4.5 **Protection from Fire**

Fire is not a problem in the PA but vigil to prevent occurrences must be employed at all times. The sources of wild fires can be:

- Carelessness on the part of some visitor/villager while walking along the road and throwing cigarettes/bidi butts or a lighted matchstick.
- For a new flush of grasses to come up they are burnt.
- Non-removal of excess grass in time/periodically.
- Set fire to beehives for honey collection.
- The temperatures go up to 45 °C for prolonged periods in the summer.
- Destroying evidence of illegal activities

The following management practices to protect the PA's from fire are prescribed:

- (1) Smoking, carrying of cigarettes, matchboxes and lighters should be strictly prohibited in the PA. All the visitors to the PA should be checked for cigarettes, lighters and matchboxes and should be made to deposit them at the entry points. Offenders are liable to be fined.
- (2) Picnics and cooking inside the PA must be totally prohibited.
- (3) Entry of tourists beyond embankment and bunds should be prohibited. Villagers collecting grass should be checked for bidies and matchboxes by the authorities.

7.4.6 **Protection from Illicit Wood Cutting**

Illicit woodcutting to meet fuel wood requirement free of cost is another problem that the PAs face. Wood cutting cases are more during winters. Off and on many women folk collect the wood lying on the floor of the forest. Periodic hacking

of branches by the local people generates this wood. The following management practices are prescribed for protection against woodcutting: -

1. Constant patrolling and vigil by the staff.
2. All breaches in the embankment and boundary fence should be promptly repaired.
3. Certain eco development activities like provision of alternative fuel sources of biogas, smokeless chullahs, removal of weeds with the help of the local communities so that they are able to satisfy their needs and the management objectives are fulfilled are to be taken up.

7.4.7 Protection from Poaching

Poaching of wild animals in these PA's is rare but cannot be completely ruled out. This PA is prone to the following types of poaching:-

- (a) Poaching of fishes.
- (b) Poaching of the wild Reptiles & Mammals.
- (c) Poaching of table birds outside the PA's.

The poaching of the wild mammals and reptiles can take place on a moonlit night. The poachers are generally from one or two settlements of Bawarias.

Poaching of table birds like ducks and geese may take place during winter in the vicinity of the PA. These birds have the habit of going outside the PA and feeding in the fields. The poachers sit in these fields and shoot them.

During summers the water in the marshes start drying and the air breathing fishes in the ponds can be seen in the shallow water and mud. Large numbers of fish get restricted to small puddles of water and some of them die naturally due to congestion. This is the time when these fishes are prone to poaching. The management practices prescribed for the protection of the PA against poaching are as follows: -

- (1) Special precaution needs to be taken in summer and on moonlight nights.
- (2) Constant night patrolling of the area should be done during moonlit nights. Help of village forest committees should be taken.
- (3) The water bodies prone to fish poaching should be strictly guarded at night and the persons on duty should be equipped with torches and lathis.

- (4) During winter months night patrolling should be done outside the PA's in areas where the birds go out to feed.
- (5) No person (whosoever he may be) should be allowed to enter the PA with firearms.
- (6) Intelligence should be gathered on all strategic points.

7.4.8 Protection from Pollution

The ecosystem of PA's is prone to the following types of pollution.

1. Water Pollution
2. Noise pollution

Water Pollution

As already stated PA is an artificial ecosystem. The water below ground water inside and outside PA is connected and the former receives pesticides from the latter. In this process the chemicals left over in the fields because of the excessive use of chemical fertilisers and pesticides, get dissolved in below ground water of PA which has a direct impact on above ground water chemistry of the PA, which in turn affects the aquatic vegetation and dependent fauna.

It is proposed to conduct an integrated pest management programme in the catchment area of PA in collaboration with the Agriculture Department and the University of Agriculture, Hisar. Obviously regular research and monitoring will have to be done on all aspects so that appropriate remedial measures can be taken to ensure sustainability. Other reputed agencies are to be associated with the PA for research and monitoring work.

Noise Pollution

As far as the noise pollution aspect is concerned, the number of automobiles particularly tractors have increased many fold in the recent years. Proportionately the number of vehicles coming to the PA has also increased. If these vehicles are allowed to move about freely in the PA it would lead to extremely damaging disturbance and noise pollution. Therefore no tractors and local diesel vehicles are to be allowed in the core/bird watching zone.

The following measures are prescribed to protect the PA from various kinds of pollution.

- (1) The vehicular traffic inside the PA should be minimized. No diesel vehicles are to be allowed in the core/bird-watching zone.
- (2) Carrying of foodstuff in polythene bags should be totally banned because the visitors throw the polythene material in the marshes thereby polluting it or on roads spoiling the natural habitat.
- (3) No transistors are to be allowed in the PA.
- (4) Visitors should be advised not to shout or make any noise etc.

7.4.9 Census

7.4.9.1 Animal Census

Water hole counts

Water hole counts should be done during the dry season over a period of 24 hrs.

- ❖ The survey shall be undertaken at the time of the year with the least availability of water. This will often be in mid-late May coinciding with the full moon.
 - ❖ Machan construction may be done wherever necessary for at least two people. It should allow adequate visibility and should be constructed a few days before the census period.
 - ❖ Field staff should be selected well in advance, using one experienced literate person plus one helper for each census point. Staff should be trained in methodology and in using the proforma by a trial run sitting at the waterhole for a few hours, and they should be aware of the objective and importance of the census. They should take food, water etc with them for the full census period. Binoculars should be issued at the most important waterholes.
 - ❖ Census should start in the evening of day one with staff having rested (hopefully sleeping) during the day. Data collection should start after arrival in the machan, to eliminate the disturbance period.
 - ❖ The census should continue for a full 24 hrs after the data collection begins.
- The basic assumptions to use the method as an index are as follows

- 1 There is a linear relation ship for each animal species between the number of animals seen drinking over a time period and the number of animals in the area.
- 2 The field staff are able to record the unbiased estimate of the animal numbers drinking at the waterhole; i.e. the staff remains awake, are literate and their presence in a hide does not deter animals from drinking.
- 3 The animal drinks only once for 24 hrs though there is no scientific basis for this fact.

7.4.9.2 Bird census

Heronry census

Breeding of all heronry species except the Painted stork begins in July and extends up to October depending on the onset of rain. The painted stork is a late breeder starting towards the end of August and beginning of September and extending up to November or early December.

Waterfowl count

Total count of waterfowl shall be estimated by counting the birds simultaneously in various parts from vantage points. Counts shall be taken each month from September to May. In January it is to be ensured that the count takes place before the first full moon. Counts are to be done half an hour after sunrise to 1100 hrs and from 1500 hrs to half an hour prior to sunset.

Precautions

- ✓ All observers should be adequately trained in the methodology of bird and animal census and should reach a comparative level of competence. This is particularly important in order to avoid observer bias in comparisons.
- ✓ Counts should be conducted during the period of maximum activity i.e. half an hour after sunrise to 1100 hrs and from 1500 hrs to half an hour prior to sunset.
- ✓ Counts should be conducted during period of clear weather.

- ✓ Care must be taken to ensure that visibility in habitats being compared is similar. Where this is not possible, existing conditions during the count should be adequately described. This will help in correct interpretation of census results.

8 Ecotourism, Interpretation and Conservation Education

8.1 General

Bhindawas and Khaparwas wildlife sanctuaries in the State of Haryana are important wetlands besides ecological heritage sites. They are located in Jhajjar district and are best known for their local avian fauna and congregation of migratory waterfowl.

These are situated in highly populated area, surrounded by numerous communities all of whom seek to use the PA's resources and valuable water supply.

Both PA's are renowned for:

- Heronry during July-November
- A place of halt and dispersal for migratory birds that winter in the Indian subcontinent.
- Protected area's with high biodiversity index.
- A refuge for several threatened species of birds, mammals, reptiles and insects.
- A home to several species of owls and birds of prey.

The two wildlife sanctuaries and adjoining protected forest areas along canals and drains have good heronry where a large number of resident birds breed on Acacia trees. However, for the present, these do not receive significant number of tourists because they are located in a totally rural setting at a fair distance from urban world and there is no stay facility for tourist. Both Boarding as well as lodging facilities are absent. It is not connected with rail. Road from Delhi to District headquarter does not encourage tourist and from Jhajjar to PA. It is a 15 Km drive on link roads.

For the present, the visitors are Government officials, Nature students and researchers.

It is also a potential centre for scientific research on the biology of water birds and wetland ecology. For the bird lovers the real charm of the place lies in observing the high biodiversity of avian fauna in the PA's particularly during the breeding season i.e. from July to November. Photographers, scientists and nature lovers visit this place.

For the present, the annual number of visitors to the PA's was not much and did not require much management. With the induction of conservation education in the school and college curriculum and greater focus by the media, more and more people have started visiting protected areas. This will also result in an increase in number of tourists, both domestic as well as from Delhi and other nearby cities.

8.2 Objectives

To provide an enriching wilderness experience and visitor satisfaction through conservation education and wildlife interpretation programmes. The basic objective of allowing tourism in the wildlife sanctuary is to bring people close to nature and then appreciate its beauty and need for the conservation of wildlife and its habitat. It is also aimed that people from cities come and enjoy rustic charm of village life along with gaining some knowledge about the medicinal plants their usage and local flora of the area.

8.3 Issues/Problems

The expected increased presence of people will cause disturbance by interrupting feeding or breeding behaviour and altering ranging patterns. Alternately, wildlife may become habituated to human presence, possibly becoming reliant on scavenging food from visitor areas. In addition, indirect effects of tourism on wildlife include impacts on habitat, water supply and prey species. There is need to take preventive measures in anticipation.

In these PA's the major anticipated impacts of tourism are as follows

8.3.1 Bird Disturbance

Considerable amount of disturbance is caused by trying to get close to the nest in order to take photographs. This form of unrestricted observation disturbs nesting birds. Species like the barn owl and lesser-spotted eagle, painted storks abandon their nests due to excessive disturbance by tourists. Tourists tend to get too close to the birds by wading through the marshes.

8.3.2 Litter

Litter is perceived as a major problem associated with visitor.

8.4 The Strategies

8.4.1 Identification of Zone

It has therefore become all the more important to manage and regulate the tourist traffic in this PA in order to preserve its natural tranquillity. Hence the following management practices are prescribed to improve the recreational and educational value of the PA.

For proper management of tourism the following zones are to be managed in the following way.

A. Bird Watching zone. The Bird Watching Zone consists of peripheral embankment and inner bunds. The whole PA can be clearly viewed by moving on the zone. There are two watch towers located at vantage points and a third one, to the west of wetland, is proposed.. The zone is to be managed for better viewing of the birds and awareness to be generated in the tourist.

B. Administrative cum tourist facility Zone. The administrative and tourist facility Zone consists of the following:-

- Wildlife establishment office.
- Camp office of Divisional Wildlife Officer.
- The Rest House be used as inspection hut and as stay facility for nature students and wildlife researchers. It is proposed to identify 5 five tenting sites and kitchen facility.
- A visitor interpretation centre with reading material on wildlife, forests and nature education.

Management practices. The following management practices are prescribed for the two zones

- A.** The Bird Watching Zone
- (i) Visitors would travel in this zone either on foot, on bicycles, cycles rickshaws. No vehicles are to be allowed on inner bunds. No other means of

transport should be permitted with the exception of management vehicles or research vehicles.

- (ii) Some view points would be identified and provided with benches and trash bins. These viewing points should not be located at very conspicuous places and would be well camouflaged.
- (iii) Shelters would be created at vantage points for the benefit of the tourists.
- (iv) A provision for installing telescopes may be made for the benefit of those who do not possess binoculars. These may be installed at a few important viewing points and should be looked after by a person who would also do the job of interpretation.
- (v) Old structures of watchtowers would be given a face-lift so that they merge with nature and in the old architectural style.
- (vi) Strict vigil is to be maintained by the staff against vandalism and disturbance of animals. Offenders are to be punished. Rates of penalties would be notified and displayed at appropriate places like main gate, watch towers and the Interpretation centre.
- (vii) Visitors will be encouraged to collect litter and bring it out of the PA. Co-operation of school/college students and local people is to be taken to carry out cleaning operations.
- (viii) Visitors are not to be allowed to enter the waters so the the waterfowl is not disturbed.
- (ix) Directional signs will be placed along the visitors path.

B. The Administration cum tourist facility area:-

This is a very important and strategic area because the visitor first comes to this place. This is the place where one should be properly guided and educated before one goes inside. It comprises of the administrative area. Therefore, management may be adopted as under

- (a) All persons entering the PA should get registered for record. No fee is prescribed for the time being as tourism in significant way is yet to take off.

(b) The visitor should be encouraged to visit the interpretation/orientation centre so that they can get an overview of the PA and can plan their visit accordingly. The Orientation Centre would display the trails and their distances and also themes like Wetland Values, wetlands of international importance, world conventions on wetlands and PA ethics.

(c) Simple literature about the PA in Hindi and English, about the do & don'ts and a map of the PA would be made available to the visitor at registration point.

(d) The services of the guides or the Nature and Wildlife Interpreter's should be made available to the visitor.

PA Ethics

- You have come to enjoy nature and its tranquillity. Observe the birds and animals at their best in nature.
- Animals have a right of way. If you come upon an animal crossing the road, resting or feeding by the road side, slow down and be silent.
- Watch the wildlife at leisure and allow others to watch.
- Most animals have a keen sense of hearing and alien sounds startle them. Do not talk loudly. Control children. Small groups are ideal.
- A forest has its own particular sounds. When in the forest, why listen to any other.
- Enjoy the song of the bird. Do not bring your transistors or cassette players with you.
- Animals manage their own food. Do not feed them yours. It may prove harmful and change their behaviour.
- While on excursions, avoid smoking. This wetland is vulnerable to fire, especially during spring and summer months. Negligence, however trifling, can cause a widespread fire killing a host of living beings.
- While in a forest it is better to blend with the surroundings by wearing colours that do not jar on the eye.
- During summers, carry potable water with you on excursions.
- Getting into the water is banned.

- Carry a note book and PA map. Travel light and do not carry any valuables except cameras and binoculars.
- Keep a safe distance from the animals and birds specially when nesting. Respect their privacy and you will be rewarded with hours of undisturbed viewing.
- Early mornings and late afternoons are best suited to visit the home of animals.
- Carry home a memorable experience by engaging the services of a registered guide.

8.4.2 Education and Awareness

The tourists can be educated by means of material distributed at registration office. In order to reduce vandalism staff have to be trained, who can educate the tourists and prevent vandalism. The signboards should be erected at vantage points .The staff have to be trained at regular intervals. Nature awareness camps have to be conducted for young people who can prove a great force for the cause of conservation of our natural heritage. Conducted tours of students may be taken up using the existing interpretation facilities.

8.4.3 Infrastructure Development

8.4.3.1 Vehicles

To promote pollution free and cheap means of transport to the visitors and for patrolling an electric van should to be procured.

The tourists coming to the PA have to be managed properly. Vandalism in the PA have to be checked. Surprise checking has to be done. This calls for fast mobility, which may be served by the purchase of motorcycles.

The summer months put a heavy strain on the ecosystem. The wetland dries up and management has to provide for water at various points in the PA by transporting of water. The time period for habitat management works to be done in the PA is limited from April to June. A separate vehicle with accessories for removal of weed and grass would make the works possible in a cost effective manner. A tractor may be purchased for the purpose with limited accessories pertaining to the above jobs to be done on a regular basis.

All the vehicles are to be maintained in very good condition with minimum pollution levels.

8.4.3.2 Buildings

A separate staff line exists which needs to be maintained properly. As per sanctioned posts residences be constructed.

8.4.3.3 Communication

The existing wireless network has been strengthened. The headquarters of the different sections act as fixed stations.3 mobile handsets have been purchased so that direct communication can be established from the location itself. This has enabled proper and efficient use of resources.

As the systems run on battery power they have to be recharged from time to time. Renewable energy sources may be explored. Solar panels for all the fixed stations may be purchased for this purpose. Additional sets may also be purchased.

8.4.3.4 Interpretation Facilities

Interpretation facilities will be improved under the ongoing Interpretation Programme for which a nature interpretation centre is coming up. Periodical review of the centre may be taken up once in two to three years. The centre should be developed as a centre of learning and spread the message of conservation and the importance of water in human life.

8.4.3.5 Computer and Accessories

For better management of the PA, technology should be put to its best use..

The registration of visitors should be computerised. Appropriate software should be developed to make it user friendly. A library of films on birds is to be maintained.

8.4.4 Regulations

Visitation in PA will be allowed only between 5 A.M. to 7 P. M.

9 Eco-development

9.1 Concept and Objectives

Eco-development is a process, not just one time action.

It has been defined as a “site- specific, eco-friendly package of measures, developed through people’s participation, with the objective of promoting sustainable use of land and other resources, as well as on-farm and off-farm income generating activities which are not deleterious to PA values” (Panwar, 1992).

The objective, ultimately, is better conservation, but this in turn should mean better lives for local people and a more satisfying occupation for foresters at all levels.

An eco-development plan consists of site-specific conservation friendly package of measures for rural development and use of biomass resources by the local people, so as to help the protected area conservation.

Objectives

1. To augment incomes of the local people from on-farm and off-farm activities, so that communities have less economic dependence on the resources of the protected area.
2. To provide technology to improve efficient use of conventional resources and to provide use of substitutes, where necessary and feasible especially in relation to fuel and fodder needs.
3. To involve local communities in protection, preservation and propagation of habitats and wildlife of wetland and its values by adopting a user friendly system of management, so as to elicit public support for conservation.
4. To organise communities at the village level and provide benefits and rights to usufruct by developing viable partnership with the village communities subject to successful protection and conditions laid by the PA management i.e the constitution of eco-development committees.
5. To develop a micro institutional and technical function in the community management organization so as to make them self-sustaining in the long run with minimum dependence on the PA management i.e. self help groups.

9.2 Specific Issues

'Pressure' can be defined as the use of PA resources to the extent of creating an adverse impact on its habitat and resources or a deviation from the legal and management objectives of the area. Mounting biotic pressure on PA are due to activities within the sanctuary. These include fuel wood collection, non wood produce collection, release of unproductive cows in PA, poaching etc.

9.3 Broad Strategies

Based on their proximity to the PA and also on their apparent dependence on the PA's, The villages, namely, Bilochpura, Bhindawas, Bir Chhuchhakwas, Chadwana, Fatehpuri, Kanwah, Kasni, Khetawas, Koilpuri, Kunjiya, Nawada, Reduwas, Khaparwas and Shajanpur have been selected for the eco-development project.

The Integrated Development Programme shall include schemes that will boost the economy of the local people without disturbing the ecology of the PA. The eco-development activities would be dovetailed with the district administration and local NGO's for technical expertise and raising funds.

The local population is well motivated to undertake and expand eco-development activities. The eco-development committees will be formed so that there is active participation from the villagers. It is proposed to undertake activities like popularisation of non - conventional energy, animal husbandry, employment generation, community development programmes etcetera in a phased manner, for a period of five years.

Activities that may be taken up in the eco-development plan

(1) Formulation of microplans

It is proposed to formulate the micro plans of villages, Bilochpura, Chadwana, Kanwah, Khetawas, Nawada, Reduwas , Bir Chhuchhakwas , and Shajanpur.

(2) Promotion of non-conventional energy

It is proposed to promote use of non-conventional energy (biogas plants, unat chullas, solar lights, solar cookers etc).

(3) Cattle breed improvement

It is proposed to introduce phased reduction of scrub livestock and improvement of livestock breeds (through controlled fertilization of female stock in proper health and age with males of better local breeds, aided by sterilization of scrub bulls by way of organising cattle improvement camps.

(4) Promotion of self-help groups

The villagers may be prompted to institute self-help groups who can be provided assistance matching their contribution in the activity. The groups may take up income generation activities with coordination from other agencies in the district

(5) Encourage agro-forestry

All the agriculturists in the catchment area and the surrounding villages are to be encouraged to take up fruit orchards on their lands. This is to be undertaken with the active help of the Horticulture Dept.

(5) Development of Silvi-Pastures on Common Lands of villages

The common land of villages in zone of influence should be planted with low-density plantation. The ground storey should be planted with palatable fodder grasses and the communities should manage the pastures on sustainable basis. The forest department should collaborate with the community to facilitate grass management on scientific principles. The planting of dense tree crops should be discouraged.

(6) Bio-drainage plantations in zone of influence.

Seepage of water from the Bhindawas lake takes place across the embankment and cause water logging and secondary salinization in about 500 Ha. of agriculture land in immediate vicinity of the sanctuary. Due to this continuous malady fertile agriculture land is rendered unproductive. These marginal farmers rightly feel that the lake is responsible for degradation of their land. For this reason they look upon the sanctuary with contempt. This is not a healthy situation. The cooperation and good will of people is essential for good management and effective protection of the bird sanctuary

The feasibility of diversification of species should be explored in consultation with the farmers. Even though this activity benefits selected few

people at Government expenses, still it is strongly advocated in the best interest of wildlife.

9.4 Village Level Site Specific Strategies

Village level site specific strategies will be drawn up after making detailed village microplans.

9.5 Monitoring and Evaluation

The implementation of programmes will be undertaken by involving the local people for basic data collection. The evaluation, monitoring and research will be undertaken by the officials of state forest department.

10 Research, Monitoring and Training

10.1 Research and Monitoring

Both the sanctuaries are a part of fragile ecosystem. It keeps on changing with the slightest disturbance. It is, therefore, very necessary to closely monitor the changes taking place in the ecosystem. For this purpose a post of a Junior Research Officer is proposed for the PA. Alternatively, such studies be got done periodically through the recognised institutes by making special budget provision to that effect.

Data will be collected on the following parameters and a database developed for the better management of the PA: Physical parameters would be measured or collected from the various sources. Data like the rainfall, temperature, other meteorological data, amount of water are to be collected. Ecological parameters that include the changes in flora and fauna, the increase and decrease in the presence of various weeds, the behaviour of the various species need to be monitored. The physical and ecological parameters should reflect the changes in the eco-system and help the management in achieving its objective to maintain the PA as a wetland. Socio-economic parameters that relate to the influence of the villages around the PA are to defined and the inter-relationship of these villagers with the various interventions being taken in and outside the PA are to studied. All eco-development activities will be undertaken based on these studies. Visitor management forms an essential duty of the PA management. The visitor's satisfaction is very important so he should be provided the best possible facilities. The tourist has to be educated about conservation and the importance of conserving as a means of our very own existence. Database of the visitors should be maintained. The problems arising out of visitor movement are also to be studied and solutions sought for. Key bird and animal species should be observed and monitored very intensely. The species biology and its place in the ecosystem should be identified for the better understanding of the ecosystem and its inter-relationships. Population estimates of species and their activity should be documented.

It would be the duty of the Research Officer to co-ordinate the research and monitoring activity in the PA and should maintain a close liaison with the various agencies carrying out research and monitoring work. He would maintain a journal recording all the events of the PA. The document should reflect the condition prevailing at the time.

The research carried out by the Research Officer should be management oriented. He should closely monitor the following aspects on his area in order to facilitate efficient PA management. Projects may be developed in association with Universities and research institutes and monitored.

- (1) The water quality
- (2) The metrological data
- (3) The aquatic and terrestrial vegetation.
- (4) The availability of fishes.
- (5) The various aspects of ornithology
- (6) The population and activities of Mammals in the PA.
- (7) The annual census of animals and birds in the PA.
- (8) Satellite images of the PA are to be procured regularly and vegetation mapped. Use of satellite data should be used for the monitoring of the PA.
- (9) History of the all the PA is to be maintained. These should record the flora and fauna, water levels, and interventions by the management.

Besides the above aspects, regular research should be carried out on the following aspects of the PA in the shape of projects.

- (1) Socio-economic impact of PA on the life of people living around it.
- (2) Impact of the existence of PA on the agricultural production in the region around it.
- (3) To continue further the studies on *Eichornia* and other weed species.
- 8 To study the impact of feral cow on the ecosystem.
- 9 To study the impact of tourism on the ecology of the PA.
- 10 The Research Officer shall also be responsible for the job of up-dating the checklist of the birds and other animals from time to time.

Since specialised field staff may not be available, help of other institutions like BNHS, SACON, WII, NGO's and Universities has to be sought and projects developed.

10.2 Training

The importance of training need not be over emphasized in a world where the dissemination of knowledge is so fast. Training keeps the staff tuned in to the latest developments and also imparts more and more skills that are a must for Human Resource Development.

It leads to interaction between the management and the executives and many a times untapped staff skill comes to the fore and management also learns a lot from training (eg. difficulties of staff in carrying out operations). Training at all levels will be made a regular feature.

Themes identified for training

- Wildlife Techniques (King census, water hole census, road side monitoring, habitation impact studies etc).
- Wildlife Health Indicators (Riney's Concept - Pelvic girdle, Ribs, Colour of skin, patches on the body etc)
- How to do a post mortem? How to open a carcass?
- How to use preservatives?
- Weapon training -Handling and caring of rifles, revolvers and tranquilising guns.
- Wireless equipment handling and care.
- Legal aspects
- Detection and framing of offences.
- Fire drills - especially before the fire season for better fire fighting.
- Identification of pugmarks, tracks, dung pellets, burrows, snags and den trees.
- Identification of birds.
- Training in Interpretation (communication skills) and understanding the language of the jungle (tracks and signs).
- Monitoring Methodology.
- Census operations.
- Filling up of data sheets.

- Eco-restoration works - why, where and how?
- Training in first aid administration to man as well as animals.
- Training in use of audiovisual equipment.
- Computer Application
- Training in the conduct of PRA and formulation of microplans

Training needs will cater to the achievements of the PA objectives. A proper training need assessment shall be carried out for the forest and wildlife staff, NGO's and local communities.

10.3 **On the Job Training**

On the job training would include informal discussions as a routine field activity and organisation of short-term courses in which experts from universities and parks will be invited to give guest lectures. One day workshops will be conducted for field staff, Naturalists, Villagers, NGO's and Teachers at BWLS.

Regular budget provisions will be made.

10.4 **Formal Training Courses**

State should sponsor names of officers (DFO and RFO) for regular courses and modules held at the Wildlife Institute of India.

State Police Schools will conduct regular courses for foresters and guards on Weapon Training. Forest Legal Cell will conduct courses in understanding and application of law. Fire Fighting drills will be conducted at a regional level. Officers will be encouraged to participate in formal wildlife training courses in India and abroad.

10.4.1 **Establishing a learning Center**

The PA should be developed as learning reserve for the various research institutes which in turn are expected to help the management in better management.

10.5 **Organization and Administration**

10.5.1 **Structure and Responsibilities**

The sanctuary is state owned. As a flood control measure it is regulated by Irrigation Department Haryana. Wildlife management is with wildlife wing of Forest Department. Chief Wildlife Warden Haryana is the Chief Executive. Divisional Wildlife Officer functions from Rohtak and wildlife inspector from Jhajjar. Stationed at Bhindawas are two wildlife guards and two group D officials. It is proposed to create a post of research officers in grade of scientist with experience in ornithology.

11 The Budget

S.N.	DESCRIPTION	Estimated Expenditure in lakhs									
		2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28
1	2	3	4	5	6	7	8	9	10	11	12
A	HABITAT IMPROVEMENT	Amount in Lakh									
	<i>Vegetation Management</i>										
	Creation of new mounds for development of new heronries	10.00	15.00	28.00	0000	30.00	0000	0000	0000	0000	0000
	Repair of old mounds *	0.35	0.4	0.45	0.4	0.45	0.5	0.55	0.6	0.65	0.7
	Replacement of fallen trees by new sowing and planting in the heronry	0.4	0.45	0.5	0.45	0.5	0.55	0.6	0.65	0.7	0.75
	Restructuring of Plantation in Fringe Area & Catchment Area by selective cutting, uprooting of invader tree species as per Wild life Act and Tall planting of indigenous species using 8" tree guards for Eco-restoration	20.0	20.00	30.00	35.00	35.00	40.00	40.00	45.00	50.00	50.00
	Weed eradication	5.00	20.00	20.00	12.50	7.00	10.50	11.00	11.50	12.00	12.50
	Weed disposal with productive use through its scientific study of weed management.	0.00	5.00	5.00	4.00	1.00	1.00	1.00	1.00	1.00	1.00
C	<i>Water Management</i>										
	Survey and Mapping	0.50	2.00	2.00	0.50	000	000	000	000	000	000

1	2	3	4	5	6	7	8	9	10	11	12
	Desiltation of deep water bodies	1.00	1.10	1.20	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	Installation, maintenance and operation of existing tubewells	1.00	1.00	0.30	0.30	0.30	0.35	0.40	0.45	0.50	0.55
	Inlet & outlet management, ecosystem stability by introducing fish fingerlings, environmental monitoring of wetland	1.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
D	PROTECTION										
	Construction of boundary wall with height 4' + 4' chain link fence	50	100	100	100	100	100	50	-	-	-
	Strengthening and improvement of Bund	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	Patrolling kits/purchase of vehicle *	0.00	6.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
	Repair of wireless sets *	0.10	0.10	0.15	0.15	0.20	0.20	0.30	0.30	0.40	0.40
	Running of Motor Vehicles *	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.9	0.95
	Catching of illicit grazing cattle, , marking and driving out of the PA. *	0.15	0.16	0.17	0.18	0.19	0.20	0.25	0.32	0.43	0.54
	Training in legal procedures	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.9	0.95
	Weapon Training and maintenance	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.6	0.65	0.70
	<i>Fire Protection</i>										
	Training for fire fighting	0.25	0.25	0.30	0.30	0.35	0.35	0.40	0.40	0.45	0.45
	Controlled Burning in a mosaic manner	0.15	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
E	ECO-TOURISM FACILITIES										
	Construction of watch towers/ viewing platforms and their maintenance	0.40	10.00	4.00	3.00	0.35	0.40	0.40	0.50	0.55	0.600
	Purchase and maintenance of Electric vehicles	5.00	5.00	0.20	0.20	0.30	0.40	0.50	1.00	0.60	0.60
	Upkeep of bicycles *	0.01	0.01	0.15	0.15	0.02	0.02	0.25	0.25	0.30	0.30

1	2	3	4	5	6	7	8	9	10	11	12
	Construction tenting platforms	1.50	1.00	000	000	000	000	000	000	000	000
	Maintenance/upkeep cost of tenting places	0.10	0.10	0.10	0.10	0.10	0.10	0.15	0.15	0.15	0.15
	Purchase of computer, LCD projector and accessories	2.00	0.50	000	000	000	000	000	000	000	000
	Upkeep of computers *	0.05	0.05	0.06	0.06	0.07	0.07	0.08	0.08	0.09	0.09
	Construction/Maintenance of Residences, office premises and rest house and other buildings	2.00	15.00	12.00	10.00	3.50	3.75	4.00	4.25	4.50	4.75
	Awards for students and naturalists	0.05	0.55	0.06	0.065	0.07	0.075	0.08	0.85	0.90	0.95
	Maintenance of Interpretation Centre	1.00	1.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95
	Signage in the tourism zone	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70
	Publication of publicity materials (posters, postcards, chronicles, brochure and pamphlets.)	0.25	0.25	0.30	0.30	0.35	0.35	0.40	0.40	0.50	0.50
F	ECODEVELOPMENT										
	Preparation of village microplans	0.25	0.30	0.30	0.40	000	000	000	000	000	000
	Promotion of non-conventional energy devices -	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50
	Biodrainage and silvipasture plantations	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
G	<i>Monitoring and Research</i>										
	Purchase of equipment- Telescopes, binoculars, GPS, Compass etc,	1.00	1.50	000	000	000	000	000	000	000	000
	Status of flora and fauna	0.10	0.10	0.15	0.15	0.20	0.20	0.25	0.25	0.30	0.30
	Annual Census *	0.25	0.30	0.35	0.40	0.45	0.50	0.550	0.60	0.65	0.70

12The Schedule of Operations and Miscellaneous regulations

12.1 The Schedule

ITEM	Time of year
1. Creation of new mounds for Heronry	May-June
2. Repair of old mounds.	May-June
3. Replacement of fallen trees by new sowing and planting in the heronry.	May-June-July
4. Tall planting of indigenous species using 8" tree guards-eco-restoration	July-August
5. Weed eradication	Depending on need of technique adopted
6. Contour survey	April
7. Creation of deep-water bodies	May-June
8. Maintenance and operation of existing tube well.	As and when required
9. Repair of broken boundary fence.	As and when required
10. Repair of wireless sets.	As and when required
11. Training in legal procedures.	Oct-Nov
12. Weapon Training.	Dec-Jan
13. Training for fire fighting.	May-June
14. Controlled burning in a mosaic manner.	Feb
15. Construction of viewing platforms.	Oct-Nov
16. Maintenance of Rest house and other buildings.	Oct-Nov
17. Maintenance of interpretation center.	Oct-Nov
18. Signage in the tourism zone.	Oct-Nov
-80-	
19. Preparation of village microplans	Feb-Mar
20. Bio-drainage and silvi-pasture plantations.	July-Aug
21. Status of flora and fauna.	Oct-Mar
22. Annual Census.	June and Jan

12.2 Record of Deviations and Implemented Targets

A Sanctuary book will be maintained to record strategies, annual targets, achievements, deviations etc as per below given proforma:

Sr. No.	Year	Zone/ Theme Plan	Nature of strategy	Target Fixed in Plan		Achievement		Remarks
				Physical	Financial	Physical	Financial	
1	2	3	4	5	6	7	8	9

The sanctuary book will be placed before the Chief Wildlife Warden for his perusal in the month of April every year. Necessary action with regard to deviations will be taken as advised by Chief Wildlife Warden.

12.3 Record of Employment Potential

Record for all categories of posts, regular engagement of persons, those engaged on contractual or daily wage basis for each management action under the various strategies. Employment generated will be projected in terms of man months.

12.4 Control Forms

Control forms as prescribed in management plan manual and relevant to the sanctuary will be maintained meticulously.

HARYANA GOVERNMENT
WILD LIFE PRESERVATION DEPARTMENT
Notification.

May 7, 1986.

No. S.O.31/C.A. 53/72/S.19/86:- In exercise of the powers conferred by section 18 of the Wild Life (Protection) Act, 1972 (parliament Act 53 of 1972), the Governor of Haryana hereby declares the areas specified below of Bhindawas Lake as sanctuary for the purpose of protecting propagating developing wild life and its environment:-

SPECIFICATION

District	Tehsil	Village & H.B.No.	Description of Area		Area in acrs.	Boundary
			Rect No.	Kills No.		
1	2	3	4	5	6	7
Rohtak	Jhajjar	Kenah 250	7	5,6,7/1,7/2, 13,14,15,16/1, 16/2,17,18,23, 24,25,6/2.	98.71	East:- Agriculture land of Village Shehjanpur and Kenah.
			8.	3,4,5,6,7,8,12, 13,14,15,16,17, 18,23,24,25.		West:- Agriculture land of Khatwas Kolpuri and Chedana.
			9.	1,9/1,9/2,10,11, 12,12/1,12/2,12/3, 13,17/1,17/2,18, 19,20,21,22,23, 24.		North:- Agriculture land of village Kiloopura, Shehjanpur and Khatwas.
			17.	1,2/1,2/2,8/9, 10/1,10/2,11/1, 11/2,12/1,12/2, 13,14.		South:- Agriculture land of village Chedana, Nagsida Kenah & Redwas.
			18.	1,2,3,4/1,8/2, 7/1,7/2,8,9,10, 11/1,11/2,12,13, 14,15.		
			19.	3,4,5,6,8/1,8/2, 12,13,14,15/1, 15/2,16/1,16/2,17, 18,19,22,23,24,25,7.		
			20.	2,3,4/1,4/2,5/6,7, 8,9,12,13,14,16,17, 18,19/1,19/2,23,24, 25.		
			3A.	3,4,5,6,7,14,15,16,25.		

1 2 2 3 3 4 5 6 7

Rohtak Jhajjar Bileah 34 1,2,3,4,5,6,7,8,9, 224.60
 pure.
 216
 10/1, 10/2, 10/3, 11,
 12/1, 12/2, 15/1, 15/2,
 13/3, 15, 16/1, 16/2,
 17/1, 17/2, 18, 19/1,
 19/2, 20/1, 20/2, 21/1,
 21/2, 22, 23/1, 23/2,
 23/3, 24/1, 24/2, 25/1,
 25/2.

35. 3, 4/1, 4/2, 5, 6, 7/1, 7/2,
 8, 13/1, 13/2, 15/1, 15/2,
 15/3, 15/4, 16/1, 16/2,
 16/3, 17/1, 17/2, 17/3,
 18/1, 18/2, 23/1, 23/2,
 24, 25/1, 25/2, 14/1,
 14/2.

38. 1, 2, 10, 11, 12, 13/1,
 13/2, 17, 18, 19, 20,
 21/1, 21/2, 22, 23, 24,
 25.

39. 5, 6, 7, 1, 7/2, 13, 14,
 15/1, 15/2, 16/1, 16/2,
 17/1, 17/2, 17/3, 18, 25

42. 1, 2/1, 2/2, 3/1, 3/2, 4, 5,
 6, 7, 8, 9, 15/1, 15/2, 16, 17,
 25.

43. 1, 6, 7, 8, 9/1, 9/2, 9/3, 10,
 11, 12/1, 12/2, 22/3, 13,
 14, 15/1, 15/2, 15/3, 16,
 17, 18, 19, 20, 21/1, 21/2,
 22/1, 22/2, 22/3, 23/1, 23/2,
 24/1, 24/2, 25.

44. 6, 7, 8/1, 8/2, 9, 10, 11, 12,
 13/1, 13/2, 14, 15/1, 15/2,
 16, 17/1, 17/2, 18, 19, 20,
 21, 22, 23/1, 23/2, 24/1,
 24/2, 25.

45. 3/1, 3/2, 4, 5/1, 6/1, 7, 8,
 9/1, 9/2, 10, 1, 10/2, 10/3,
 11/1, 11/2, 12, 13/1, 13/2,
 14/1, 14/2, 14/3, 15, 16/1,
 16/2, 16/3, 17/1, 17/2, 17/3,
 18/1, 18/2, 19, 20/1, 20/2,
 20/3, 21, 22/1, 22/2, 22/3,
 22/4, 23/1, 23/2, 25/1, 25/2,
 25/3.

46. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10/1, 10/2,
 11/1, 11/2, 11/3, 12/1, 12/2,
 13/1, 13/2, 18, 19, 20/1, 20/2,
 20/3, 21, 22.

Countd 8/-3-

1 2 3 4 5 6 7

Rohtak Jhojjar Reduwa
219.

168-82

- 1. 25.
- 2. 21.
- 3. 1, 2, 3, 9, 10, 11, 12, 13, 19, 20, 21, 22.
- 4. 4, 5, 6, 7, 13, 15, 16/1, 16/2, 17, 18, 19, 20/1, 20/2, 21/1, 21/2, 22, 23, 24, 25/1, 25/2.
- 5. 1, 9, 10, 11/1, 11/2, 12, 13, 14, 16/1, 16/2, 17, 18/1, 18/2, 19, 20/1, 20/2, 21, 22/1, 22/2, 23, 14/1, 24/2, 25/1, 25/2.
- 6. 5, 6, 7, 14, 15, 16, 17, 23, 24, 25.
- 7. 3, 4, 5, 6, 7, 8, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25.
- 8. 1/1, 1/2, 1/3, 2, 3, 4, 5/1, 5/2, 6, 7/1, 7/2, 8, 9/1, 9/2, 10, 11, 12, 13, 14/1, 14/2, 15, 16, 17/1, 17/2, 18/1, 18/2, 19, 20, 21/1, 21/2, 22, 23/1, 23/2, 24, 25.
- 9. 1, 2, 3, 4, 5, 6, 7, 8/1, 8/2, 9, 10/1, 10/2, 11, 12, 13, 14, 15, 16, 17, 18, 19/1, 19/2, 20, 21/1, 21/2, 22/1, 22/2, 23, 24, 25.
- 10. 1, 10, 11.
- 11. 1, 2, 3, 4, 7, 8/1, 8/2, 9/1, 9/2, 10, 11, 12, 13/1, 13/2, 14, 15, 16, 17, 18, 14/1, 14/2, 19, 20, 21, 22/1, 22/2, 23, 24.
- 12. 1, 2, 3, 5/1, 5/2, 6, 7, 8, 9/1, 9/2, 10, 11, 12, 13/1, 13/2, 14, 15/1, 15/2, 16, 17, 18, 19, 20, 21, 22, 23/1, 24, 24/2, 25/1, 25/2, 4/1, 4/2.
- 27. 1, 2, 3, 4, 5/1, 5/2, 6, 7, 8, 9, 13/1, 13/2, 14, 15, 16/1, 16/2, 17/1, 17/2, 25.
- 28. 1, 2, 9, 10, 11/1, 11/2, 20, 21.
- 29. 5, 25.

Rohtak Jhojjar Subjahanpur.
215.

182-96

- 42. 5, 6, 7, 14, 15, 16, 17, 18, 22, 23, 24, 26/1, 25/2.
- 44. 2, 3, 4, 5, 6, 7, 8, 9/1, 9/2, 10, 11, 12/1, 12/2, 13, 14, 15, 16, 17, 18, 19/1, 19/2, 20/1, 20/2, 21/1, 21/2, 22/1, 22/2, 23/1, 23/2, 24/2, 25.
- 54. 1/1, 1/2, 2, 3, 4, 5, 6, 7, 8, 9, 10/1, 10/2, 11, 12/1, 12/2, 13, 14/1, 14/2, 15/1, 15/2, 16, 17, 19, 20, 21, 22/1, 22/2, 23/1, 23/2, 24, 25, 18.

1 2 3 4 5 6 7

Robtek Jhajjar Sebjahan 55. 1/1, 1/2, 2/3, 1, 3/2, 4/1, 4/2,
Bir-215. 5, 6, 7, 8, 9/1, 9/2, 10, 11, 12/1,
12/2, 13, 14, 15, 16, 17/1, 17/2,
18, 19, 20, 21, 22/1, 22/2, 23,
24/1, 24/2, 25.

56. 211 1/1, 1/2, 2/1, 2/2, 3, 4, 5/1,
5/2, 6/1, 6/2, 7, 8, 9, 10/1, 10/2,
11, 12, 13, 14, 15/1, 15/2, 16, 17,
18/1, 18/2, 19, 20, 21/1, 21/2,
22, 23/1, 23/2, 24, 25.

57. 3, 4/1, 4/2, 5/1, 5/2, 6, 7, 8, 12,
13/1, 13/2, 14/1, 14/2, 15/1, 15/2,
16, 17/1, 17/2, 17/3, 18/1, 18/2, 18/3,
18/4, 19/1, 19/2, 19/3, 2, 21/2, 21, 22/2,
22/3, 23, 24/1, 24/2, 25/1, 25/2.

58. 1/1, 1/2, 2, 3/1, 3/2, 4, 5, 6, 7/1, 7/2,
8, 9.

59. 1, 2, 3/1, 3/2, 4, 7, 8/1, 8/2, 9, 10/3,
10/2, 11/2, 12/1, 12/2, 13, 18, 19, 20, 21

60. 1, 2, 3/1, 3/2, 4, 5, 7, 8, 9, 10/1, 10/2,
11/1, 11/2, 12, 13.

Robtek Jhajjar Ghodwana 2. 18, 19, 21, 22, 23, 24/1, 24/2, 25. 204, 31
218.

3. 1/1, 1/2, 9, 10, 11, 12/1, 12/2, 13,
17, 18, 19, 20/1, 20/2, 21, 22, 23, 24, 25.

4. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11/1, 11/2,
12, 13, 14, 15/1, 15/2, 15/3, 16, 17,
17/1, 17/2, 18/1, 18/2, 19, 20, 21, 22,
23/1, 23/2, 24, 25.

5. 4, 5, 6, 7, 14, 15/1, 15/2, 16, 17,
24/1, 24/2, 25.

8. 4, 5/1, 5/2, 6, 7, 14, 15, 16, 17.

9. 1, 2, 3, 4/1, 4/2, 5/1, 5/2, 6, 7/1, 7/2,
8, 9, 10, 11, 12/1, 12/2, 12/3, 13/1,
13/2, 14, 15/1, 15/2, 16, 17, 18, 19, 20.

10. 1/1, 1/2, 2, 3, 4/1, 4/2, 5, 6, 7/1, 7/2, 8,
9/1, 9/2, 10/1, 10/2, 11/1, 11/2, 12/1,
12/2, 13/1, 13/2, 14/1, 14/2, 14/3, 15, 16, 17,
18, 19, 20.

11. 1, 9, 10, 11, 12, 13, 17, 18, 19, 20, 23/1,
23/2, 24, 25.

12. 1, 9, 10/1, 10/2, 10/3, 11/1, 11/2, 11/3,
12, 13, 17, 18, 19, 20/1, 20/2, 21, 22, 23, 24, 25.

Countd . . . 3/-6.

1 2 3 4 5 6 7

Rohtak Jhajjar, Chodwana 13. 3,4,5,6/1,6/2,7,8,
218. 13,14,15/1,15/2,16,17,
18,23/1,23/2,24,25.

26. 1/1,1/2,2,3,4,7/1,7/2,8/1,
8/2,9/1,9/2,9/3,10/1,10/2,
11,12,13,18/1,18/2,19,20,
21,22,23.

27. 9,10,11/1,11/2,12,19,20,21.

28. 3,4,5,6,7,8,13,14,15,16/1,
16/2,17,18,23,24,25.

29. 3,4/1,4/2,4/3,5,6/1,6/2,
7,8,13,14,15/1,15/2,16,
17,18/1,18/2,23/1,23/2,
24/1,24/2,25.

42. 3,4,5,6..

M.K. NIGLANI,

Commissioner and Secretary to Govt. HR,
Wild Life Preservation Department.

Sample
26-2-88.

[Authorised English Translation]

HARYANA GOVERNMENT
WILD LIFE PRESERVATION DEPARTMENT

Notification

The 27th March, 1991

No. S. O. 49/C. A. 53/72/S. 18/91.—In exercise of the powers conferred by section 18 of the Wild Life (Protection) Act, 1972 (Act 53 of 1972), the Governor of Haryana hereby declares the areas specified below to be a sanctuary for the purpose of protecting, propagating, wild life and its environment :—

SPECIFICATIONS

District	Tehsil	Village and H. B. No.	Rectangle No.	Kila No.	Kanal	Marla	Total area in acres	Boundaries
1	2	3	4	5	6	7	8	
Rohtak	Jhajjar	Bir Chhuchhakwas, 118	155	5/1	3-6	172 6 17	A.K.M.	East: Agricultural land of Village Khetawas
			14/2	15/1	3-8			
			15/2	16	0-16			West: Agricultural land of village Bir Chhuchhak.
			17/1	1-12	7-4			

1	2	3	4	5	6	7	8
Rohtak	Jhajjar	Bir Chhuchhkwas, 118	155— contd	17/2/1 18/1/1 22/2 23/2 24 25 10/2 11/2 12 18 19 20 21 22 23 24 25	6-5 1-12 0-12 6-11 7-11 7-11 8-13 4-12 7-15 9-18 8-0 8-0 8-0 8-0 8-0 8-0 10-0 2-5		North : Agricultural land of village Bir chhuchhkawas South : Agricultural land of village Khetri - was

1	2	3	4	5	6	7	8
Rohtak	Jhajjar	Bir Chhuchhakwas, 118	159— contd	11	5-15		
				10	9-2		
				12	4-7		
				20	8-8		1
				21	5-8		
				26	1-3		
			160	1	8-0		
				2	8-0		
				3	8-0		
				4	8-0		
				5	7-16		
				6	8-0		
				7	8-0		
				9	8-0		
				10	8-0		
				11	8-0		
				12	8-0		
				13	8-0		
				14	8-0		
				15	8-0		

1	2	3	4	5	6	7	8
			160	16	8-0		
				17	8-0		
				18	8-0		
				19/1	2-12		
				19/2	5-8		
				20	8-0		
				21	7-11		
				22	7-11		
				23	7-11		
				24	7-11		
				25/1	1-14		
				25/2	5-17		
			161	1/2	0-6		
				2/2	6-4		
				3	8-0		
				4	8-0		

1	2	3	4	5	6	7	8
			161	5	8-0		
				6	8-0		
				7	8-0		
				8	8-0		
				9	7-12		
				10/1	5-7		
				11/1	7-12		
				12	7-12		
				13/1	6-8		
				13/2	2-12		
				14	8-0		
				15	8-0		
				16	8-0		
				17	8-0		
				18	4-0		

1	2	3	4	5	6	7	8
				161	20	7-4	
					21	6-11	
					20	5-7	
					23	6-9	
					24	7-11	
					25	7-11	
			162		6/1	0-0	
					15/2	4-4	
					16	8-0	
					17/1	3-8	
					23/2	2-7	
					24/1/2	1-18	
					25/1	7-4	
					25/8	0-4	
					3/2/2	6-18	
					4	8-0	
					5	6-16	
					7	8-0	
					6	7-8	

1	2	3	4	5	6	7	8
				162	8	8-0	
					9/1	2-11	
					10/1	0-6	
					11/2	1-10	
					12/1	0-4	
					12/2/2	4-8	
					14	8-0	
					15	7-8	
					16/1	6-16	
					16/2	0-12	
					17	8-0	
				173	18	8-0	
					19/1	4-8	
					19/2	3-12	
					20/1	2-10	
					24/2	1-8	
					25	7-8	

8
8

1	2	3	4	5	6	7	8
					174	1	8-0
					2		8-0
					3		8-0
					4		8-0
					5		8-0
					6		8-0
					7		8-0
					8		8-0
					9		8-0
					10		8-0
					11		8-0
					12		8-0
					13		8-0
					14		8-0

1	2	3	4	5	6	7	8
				174	15	8-0	
				16	8-0		
				17	8-0		
				18	8-0		
				19	8-0		
				20	8-0		
				21	8-0		
				22	8-0		
				23	8-0		
				24/1	3-16		
				24/2	4-4		
				25	8-0		
				175	1	8-0	
				2	8-0		
				3	8-0		

1	2	3	4	5	6	7	8
				4/1	4-7		
				4/2	3-4		
				5	7-9		
				6	4-10		
				7	8-0		
				8	8-0		
				9	8-0		
				10	8-0		
				11	8-0		
				12	8-0		
				13	8-0		
				14	7-16		
				18	10-2		
				19	8-0		
				20	8-0		
				21	8-0		
				22	8-0		
				23	4-6		
			176	1/1	0-17		
				1/2	0-6		

1	2	3	4	5	6	7	8
			177	1	8-0		
				2	6-10		
				10	9-4		
				11	5-6		
			178	1	7-7		
				2	7-7		
				3/1	4-7		
				3/2	3-6		
				4	7-7		
				5	7-7		
				6	8-0		
				7	8-0		
				8	8-0		
				9	8-0		
				10	8-0		
				11	8-0		
				12	8-0		

1	2	3	4	5	6	7	8
	Rohtak	Jhajjar	Bin Chhu-- Chhakwas, 118--contd	A.K.I.I. ---	13	8-0	
					14/1	4-0	
					14/2	4-0	
					15/1	4-0	
					15/2	4-0	
					16	8-0	
					17	8-18	
					19	8-0	
					19	8-0	
				179	1/2	4-8	
					2	7-7	
					3	7-7	
					4	7-7	
					5	7-7	
					6	8-0	
					7	8-0	
					8	8-0	

1	2	3	4	5	6	7	8
Rohtak	Jhajjar	Bir Chhu- Chhakwas, 118—concl'd.	A.K.M.		9	8-0	
					10	8-0	
					13	6-0	
					14	8-0	
					15	8-0	
					16	3-16	
					202	3-8	
					203	15-7	
					225/1	2-16	
					339	6-16	
					251/1	2-16	
					225/2	5-13	
					344/2	1-19	
					341	4-4	
					342/1	6-6	
							1982-5

1	2	3	4	5	6	7	8
Rohitak	Jhajjar	Khetawas, 205—contd.	A. K. M. 31—4—2	8	18	5—9	
					19	6—15	
					21	2—12	
					22	7—11	
					23	4—2	
		16			1	6—17	
					2	8—6	
					9	4—10	
					10	8—0	
					11	8—14	
					20	6—3	
					6	3—9	
				17	15	8—4	
					16	8—0	
					17	5—10	
					23	3—14	
					24	8—0	
					25	7—18	
					22/1	1—10	
				21	23/1	3—9	
					24	5—8	

1	2	3	4	5	6	7	8
				21	25	7-14	
			22	3		9-10	
			4			8-0	
			5			5-18	
			6/2			2-16	
			7			8-0	
			8			8-0	
			9			6-16	
			11			3-8	
			12			8-0	
			13			8-0	
			14			6-16	
			18			8-16	
			19			8-0	
			20			7-7	
			21			8-0	
			22			7-6	
			31	1/1		2-4	
			32	5/1		2-12	
						<u>252</u>	2

Total areas=204 Acres, 2 Kanals and 19 Marlas

RAGHBIR SINGH,
Commissioner and Secretary to Government, Haryana,
Wild Life Preservation Department, Chandigarh.