

Site Management Plan Kallar Kahar Game Reserve



A part of
**Salt Range
Wetlands Complex**



April 2011

April, 2011

All photographs used in this report were taken by the Pakistan Wetlands Programme unless otherwise specified. The document is produced for the Federal Ministry of Environment's Pakistan Wetlands Programme and can be used as a reference giving credits to the Programme and the authors.

Copyright: © 2011 PWP – The Ministry of Environment's Pakistan Wetlands Programme

All rights reserved. Reproduction of this publication for educational and other non-commercial purposes is authorised without prior permission from the copyright holder, provided the source is fully acknowledged.

Author: Dr. Masood Arshad, Senior Manager, Pakistan Wetlands Programme, WWF-Pakistan

No part of this publication may be reproduced or used in any form or by any means – photographic, electronic or mechanical, including photocopying, recording, taping or information storage and retrieval systems – without permission of the author.

Available from: PWP – The Ministry of Environment's Pakistan Wetlands Programme

House No. 62, Street No. 25, Sector F-10/1, Islamabad

Tel: ++ 92 51 2114125 -29

Fax: ++ 92 51 2114130

Contents

Contents	Page #
List of Acronyms and Abbreviations	iv
List of Figures	v
List of Tables	v
List of Boxes	v
Acknowledgements	vi
Executive Summary	vii
1.0 Introduction	1
1.1 Why are wetlands important?	1
1.2 Wetlands of Pakistan	1
1.3 Wetland types of Pakistan	1
1.4 National and global environmental context	2
1.5 Issues and problems of the wetlands in Pakistan	3
1.6 Gaps and weaknesses in the Policy Environment / Legislation	3
1.7 Pakistan Wetlands Programme: concept and design	5
1.7.1 What is a Management Plan?	5
1.7.2 Wetlands Complexes Management Plans	6
1.8 Wetland Protected Areas of the Salt Range	6
1.9 Management Plan for Salt Range Wetlands Complex	6
1.10 Wetlands management plan for Kallar Kahar Lake	7
2.0 Kallar Kahar Game Reserve	8
2.1 Introduction	8
2.2 Historic significance	8
2.3 Conservation status of Kallar Kahar	8
2.4 Land tenure of Kallar Kahar Lake	9
2.5 Principal Management Objectives of Kallar Kahar Lake	9
3.0 Biophysical Environment	10
3.1 Introduction	10
3.2 Climate of the Region	10
3.3 Geomorphology and Soils of Salt Range	10
3.4 Water quality monitoring	10
3.4.1 Surface Water Quality	10
3.4.2 Ground Water Quality	11
3.5 Flora of Kallar Kahar Game Reserve	12
3.5.1 Terrestrial vegetation	12
3.5.2 Algae / Phytoplankton and Aquatic Vegetation	13
3.6 Fauna of Kallar Kahar Game Reserve	13
3.6.1 Large Mammals of Kallar Kahar Game Reserve and surrounding areas	13
3.6.2 Small mammals of Kallar Kahar Game Reserve and surrounding areas	14
3.6.3 Amphibians and Reptiles of Kallar Kahar Game Reserve and surrounding areas	15
3.6.4 Avifauna of the Kallar Kahar Game Reserve and surrounding areas	18

3.6.5	Fish Fauna of the Kallar Kahar Game Reserve.....	21
3.7	Species of Global Significance.....	22
3.7.1	Punjab Uril (<i>Ovis vignei punjabiensis</i>).....	22
3.7.2	White headed Duck (<i>Oxyura leucocephala</i>).....	22
4.0	Social Environment.....	23
4.1	Introduction.....	23
4.1.1	Secondary Data.....	23
4.1.2	Primary Data.....	23
4.1.3	Household Survey.....	23
4.1.4	Government Departments and NGOs.....	23
4.2	Issues identified by the communities.....	23
4.3	Rapid Assessment and Prioritisation of Protected Areas Management.....	24
4.3.1	Management objectives and aims.....	24
4.3.2	Pressures and Threats.....	24
4.3.3	Scoring of Pressures and Threats.....	24
4.3.4	Socio-economic Importance.....	25
4.3.5	Vulnerability.....	25
4.3.6	Objectives.....	25
4.3.7	Legal Security, Staffing and Finances.....	25
4.3.8	Management Planning and Management Decision Making.....	26
4.3.9	Research, Evaluation and Monitoring.....	26
4.3.10	RAPPAM Analysis.....	26
5.0	Potential Issues and Threats.....	27
5.1	Management Issues.....	27
5.1.1	Lack of coordination between various line departments.....	27
5.1.2	Weak law enforcement.....	27
5.1.3	Lack of field equipment and technical skills of the field staff.....	27
5.2	Ecological Issues and Threats.....	27
5.2.1	Illegal hunting and poaching of wildlife.....	27
5.2.2	Clearing of forest land from the catchment area.....	28
5.2.3	Extraction of fuelwood from the catchment area.....	28
5.2.4	Illegal livestock grazing in and around the Protected Area.....	28
5.2.5	Lack of information about the biodiversity of the area.....	28
5.2.6	Zonation of the Kallar Kahar Game Reserve.....	29
5.2.7	Introduction of exotic fish species.....	29
5.2.8	Presence of invasive species.....	29
5.3	Socio-economic Issues and Threats.....	30
5.3.1	Non biodegradable pollution originating from a broad range of human activities ..	30
5.3.2	Encroachment into the lake.....	30
5.3.3	Poverty and limited livelihood opportunities.....	30
5.3.4	Diversion of water for fruit orchards and other agricultural uses.....	31
5.3.5	Illegal cutting of wetlands vegetation for community-based products.....	31
6.0	Vision for the Kallar Kahar Game Reserve.....	32
6.1	Strategic Objectives.....	32
6.1.1	Management Planning.....	32
6.2	Developing management vision for Kallar Kahar Game Reserve.....	33

6.3	Describing management objectives for Kallar Kahar Game Reserve.....	33
6.3.1	Generic objectives of the Kallar Kahar Game Reserve’s Management Plan.....	34
6.3.2	Specific objectives of the Kallar Kahar Game Reserve’s Management Plan.....	34
7.0.	Process Adopted for the Development of Management Plan.....	35
7.1	Literature Review	35
7.2	Ramsar Guidelines.....	35
7.3	Environmental baseline studies.....	35
7.4	Field observations and meetings.....	35
7.5	Community consultations and partner meetings.....	35
8.0	Strategic Plan for Management.....	36
8.1	Management interventions	36
8.1.1	Objectives of management interventions.....	36
8.1.2	Strategic Interventions.....	36
8.2	Ecological interventions.....	37
8.2.1	Objectives of Ecological Interventions.....	37
8.2.2	Strategic interventions	37
8.3	Social Interventions	39
8.3.1	Objectives of Social Interventions	39
8.3.2	Strategic Interventions.....	40
9.0	Implementation Plan	42
9.1	Summary of Interventions.....	42
9.2	Species Specific Management Plans	42



List of Acronyms and Abbreviations

BOD	Biological Oxygen Demand
BOR	Board Of Revenue
°C	Degree Celsius
%	Percentage
CBD	Convention on Biological Diversity
CBO	Community Based Organisations
CCB	Community Citizen Board
CHAP	Conservation and Hunting Association of Pakistan
CIWC	Central Indus Wetlands Complex
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
COD	Chemical Oxygen Demand
DCO	District Coordination Officer
DO	Dissolved Oxygen
EC	Electrical Conductivity
EPA	Environment Protection Agency
Fig.	Figure
GIS	Geographic Information System
GPS	Global Positioning System
Ha	Hectare
HH	Household
M	Meter
MCWC	Makran Coastal Wetlands Complex
MM	Millimeter
MoE	Ministry of Environment
MOU	Memorandum of Understanding
NAWC	North Alpine Wetlands Complex
NCCW	National Council for Conservation of Wildlife
NEQS	National Environment Quality Standards
NGOs	Non Government Organisations
NRSP	National Rural Support programme
NTFP	Non Timber Forest Products
PA	Protected Area
PCRET	Pakistan Council for Renewable Energy Technology
PDDC	Punjab Dairy Development Council
PMNH	Pakistan Museum of Natural History
PWP	Pakistan Wetlands Programme
PW&PD	Punjab Wildlife and Parks Department
RAPPAM	Rapid Assessment of Priority Protected Areas Management

SRWC	Salt Range Wetlands Complex
SO ₄	Sulphate
STFP	Sustainable Tourism Foundation of Pakistan
Sp.	Species
TDS	Total Dissolved Solids
UN	United Nations
UNCCD	United Nations Convention on Combating Desertification
UNFF.....	United Nations Forum on Forest
USEPA	United States Environment Protection Agency
VWCC	Village Wetlands Conservation Committee
WHO.....	World Health Organisation
WWF-Pakistan.....	World Wide Fund for Nature – Pakistan
ZSD	Zoological Survey Department

List of Figures

- Figure 1: Distribution patterns of Significant Wetlands, Wetlands Eco-regions and Ramsar Sites of Pakistan. R denotes Ramsar Sites.
- Figure 2: Major wetland types of Pakistan
- Figure 3: Four major wetlands complexes covered under Pakistan Wetlands Programme
- Figure 4: Location map of the Kallar Kahar Lake
- Figure 5: An overview of submerged vegetation in the inner peripheries of the lake

List of Tables

- Table 1: Small mammals found in the Kallar Kahar Game Reserve and its surrounding areas
- Table 2: Amphibian and Reptilian species of Kallar Kahar Game Reserve and its surrounding areas
- Table 3: List of birds observed at Kallar Kahar Game Reserve and its surrounding areas
- Table 4: List of Priority Prescriptions for Implementation of Kallar Kahar Game Reserve Management Plan

List of Boxes

- Box I: Guidelines for a good Management Plan
- Box II: Guidelines for writing management objectives of the Protected Area

Acknowledgements

WWF-Pakistan would like to acknowledge the input of all those consultants from Academia, Pakistan Museum of Natural History, Punjab Wildlife and Parks Department and Ministry of Environment, who contributed in the baseline studies which was a pre-requisite of this management plan. WWF-Pakistan further acknowledges the support provided by the field teams, community members and office staff at Project Management Unit of Pakistan Wetlands Programme.

Special thanks to Richard Garstang and Dr. Ghulam Akbar for their overall support. The preparation of this management plan has been made possible with the active financial support of the Ministry of Environment's Pakistan Wetlands Programme.

Dr. Masood Arshad
January, 2011

Executive Summary

Kallar Kahar Lake is a part of the overall Salt Range Wetlands Complex and is located in District Chakwal covering an area of 85 hectares. The lake was declared as a Game Reserve on 31st May, 2006 under section 18 of the Punjab Wildlife (Protection, Preservation, Conservation and Management) Act, 1974.

It offers a variety of attractions like scenic beauty, fruit orchards, spiritual sites and dancing peacocks. Therefore, the lake was developed by the Punjab Tourism and Resort Development Department for recreational purposes such as boating and bird watching. Kallar Kahar Lake is one of the famous wetland areas in Pakistan and is an important site for migratory birds during winter season.

The great Mughal Ruler, *Zaheer-ud-Din Babar* visited this place in 1510 AD. During his stay at Kallar Kahar, Babar ordered the plantation of first *Mughal* Garden here and named it as *Safa* Garden or "*Bagh-e-Safa*", which still exists. A large single stone, elevated, carved out sitting place is also present in the garden, known as throne of *Babar* "*Takht-e-Babri*". This is a flat stage built of stone by Emperor Babar to address his army while coming down from Kabul in the quest of the crown of Delhi. In his memoirs, the *Tuzk-e-Babri*, Babar described Kallar Kahar as a "*charming place with good air*" and natural beauty.

The principal management objectives of Kallar Kahar Game Reserve are to "ensure the long-term conservation of the Kallar Kahar Lake and its associated wildlife and significant habitat". It also seeks to enhance the quality of decision making and undertake effective liaison between the local government, concerned institutions and community regarding the appropriate environmental management for the area; buildup capacity and strengthen wetlands dependent communities in sustainable use of natural resources through enterprise development; improving their livelihoods and exploring alternative options of subsistence; and, develop and implement a strategic plan in collaboration with partners and local stakeholders.

The management (strategic) plan for the Kallar Kahar Lake consists of a brief introduction to the area, details of Biophysical and Social Environment, potential issues and threats faced by the wetland (based on the baseline studies and community consultations), overall management vision for the lake, description of strategic interventions and the implementation and monitoring mechanism that not only defines the priority of an intervention but also reflects the significance of stakeholders involved in its implementation. Species specific management plan has also been mentioned for two globally significant species: Punjab Urial in the catchment area of Kallar Kahar Game Reserve and the White-headed Duck which used to winter in the Lake.

The management plan will cover a period of 10 years, during which it is expected that all the prescriptions will be implemented in collaboration with partners and stakeholders. A few funding initiatives will also be explored in order to implement complex prescriptions.

This page has been left blank intentionally

1.0 Introduction

1.1 Why are wetlands important?

Wetlands are often significant for their ecological, hydrological, social and economical values. Functioning wetlands can be a critical part of the environment as they support a high level of biological productivity and diversity, provide habitat for *flora* and *fauna* including rare and threatened communities and species, maintain local and regional hydrological regimes, remove nutrients and pollutants, act as stores for rain and flood waters and support human activities and values.

1.2 Wetlands of Pakistan

Although predominantly arid and semi-arid, Pakistan possesses a great variety of wetlands, principally in the valleys of Indus River and its tributaries and near the coast (ranging from coastal habitats to snow deserts of Himalayas and Karakorum). Pakistan is hosting more than 225 significant wetlands of diverse nature and environment; these wetlands are seasonal and permanent, covering about 9.7% of land surface. The total area of inland waters in Pakistan was estimated at over 7,800,000 ha in 1986 and the area of coastal mangrove swamps at more than 250,000 ha in 1987. Nineteen of these have been internationally recognised as Ramsar Sites (Fig. 1) by the *Ramsar Convention* Bureau. These Sites are of great ecological significance, supporting unique habitats and associated biodiversity. These wetlands support large number of water birds, including the largest populations of the globally threatened White-headed Duck *Oxyura leucocephala* and Marbled Teal *Marmaronetta angustirostris* in the Asia region. The same resource, however, also sustains an estimated 144 million permanent human residents and 3-4 million displaced persons from adjacent countries, who are benefiting from these wetlands resources.

Pakistan's permanent and ephemeral wetlands are globally significant in two ways: first, in terms of the intrinsic value of their indigenous biodiversity and secondly, as an acute example of the *poverty/subsistence-use nexus* that constitutes one of the most fundamental threats to biodiversity worldwide. The high global significance of Pakistan's wetlands is attributable to the diversity of species that they support. In all, eighteen threatened species of wetlands dependent mammals are found in the country including the endemic Punjab Urial (*Ovis vignei punjabiensis*) and Indus River Dolphin (*Platanista minor*). Further, twenty threatened bird species are supported by Pakistan's wetlands in addition to twelve reptiles and two endemic species of amphibians. Pakistan's wetlands also support between 191-198 indigenous freshwater fish species (including fifteen endemics) and a total of 788 marine and estuarine fish species. The high altitude wetlands, characterised by sites such as Karumbar Lake, situated at an elevation of 4,150 m, and Saucer Lake, at 4,250 m on the Deosai Plains, represent a relatively unique category of alpine wetlands that is confined to the Himalaya, Hindukush and Karakoram mountain cordilleras.

1.3 Wetland types of Pakistan

Knowing the location, distribution and character of wetlands, their values and uses, and the threats to them is an essential basis for developing and implementing management for their wise use. However, the global review of wetland inventories indicated lack of a standardised, systematic approach to wetland inventory across the Asian region. The review also suggests that national level wetland inventories should be developed by using an approach that is comparable with other wetland inventories and for which the Ramsar Convention should provide guidance.

Based on the hydrologic, geomorphologic, chemical or biological factors, 22 distinct types of wetlands were classified and representative areas were delineated (Fig. 2).

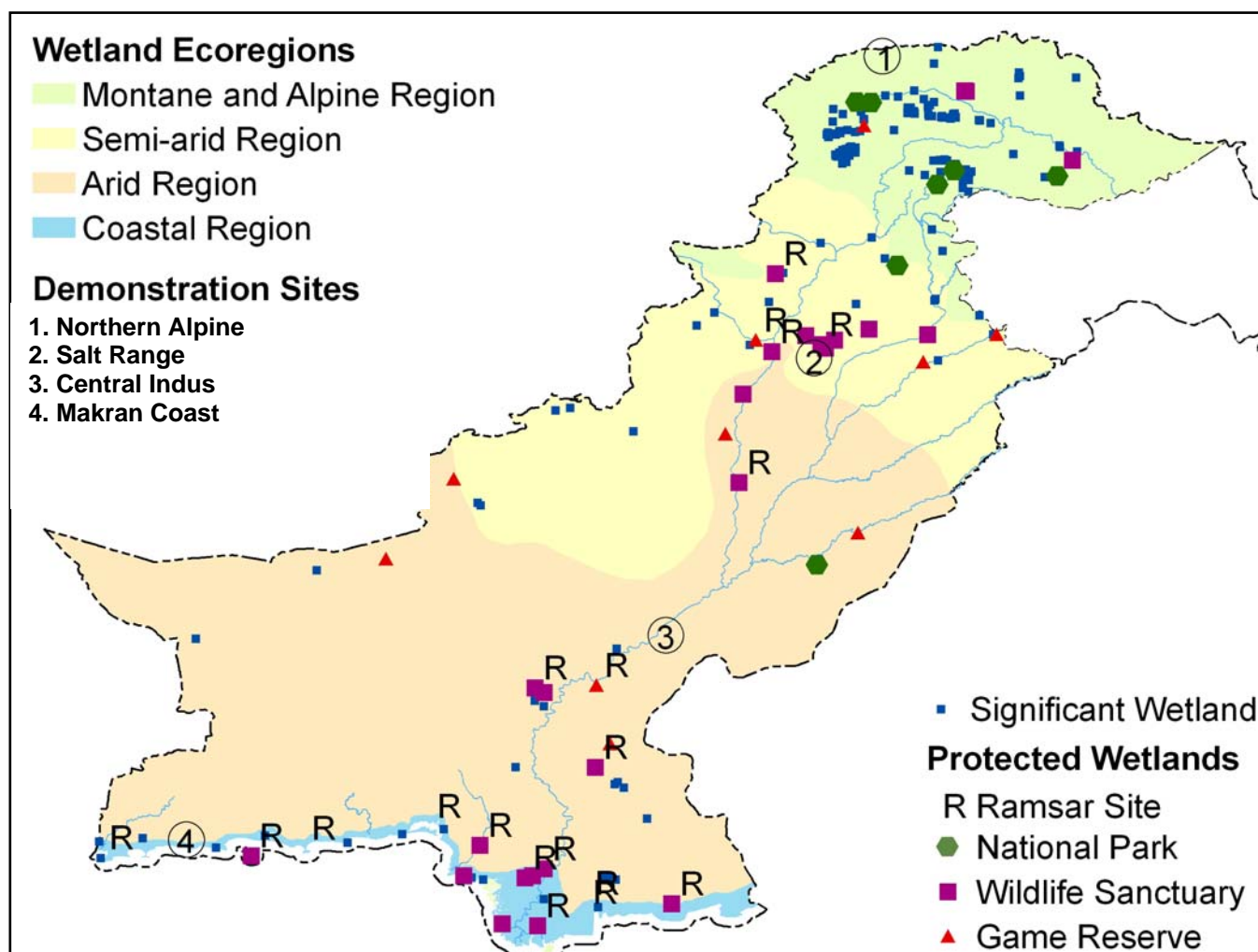


Figure 1: Distribution patterns of Significant Wetlands, Wetlands Eco-regions and Ramsar Sites of Pakistan. R denotes Ramsar Sites (19 in number).

1.4 National and global environmental context

Geographical location and boundary of Pakistan, regardless of its small size, represents a large variety of ecological conditions and is characterised by nine major ecological zones. Three major ecological realms such as *Indo-Malayan*, *Palaeartic* and *Ethiopian* (African) amalgamate in the country and support the biodiversity of all these ecological regions. Pakistan is an arid country, which was once water sufficient but now it has become a water scarce country and if same situation prevail it may be included in the list of water deficit countries. The wetlands are one of the main sources of water for human such as agriculture, domestic use and for industrial purposes. These wetlands also provide habitat to a range of wetlands biodiversity which is of great economic value to human being and is directly related to the livelihoods of the dependent communities. The plenty of wetlands is crucial to dilute the flood intensity and infrastructure losses in addition to their importance to govern the agriculture-based economy of the country. These wetlands are of immense ecological importance for their unique ecosystems which are supporting the biodiversity of international concerns. About eighteen threatened wetlands dependent mammal species are found in the country including endemic Indus River Dolphin (*Platanista minor*) and the Punjab Urial (*Ovis vignei punjabiensis*). These habitats are host to

20 threatened bird species; 12 reptiles; 2 endemic amphibian species; and 198 freshwater including 15 endemic, and 788 marine and estuarine fish species.

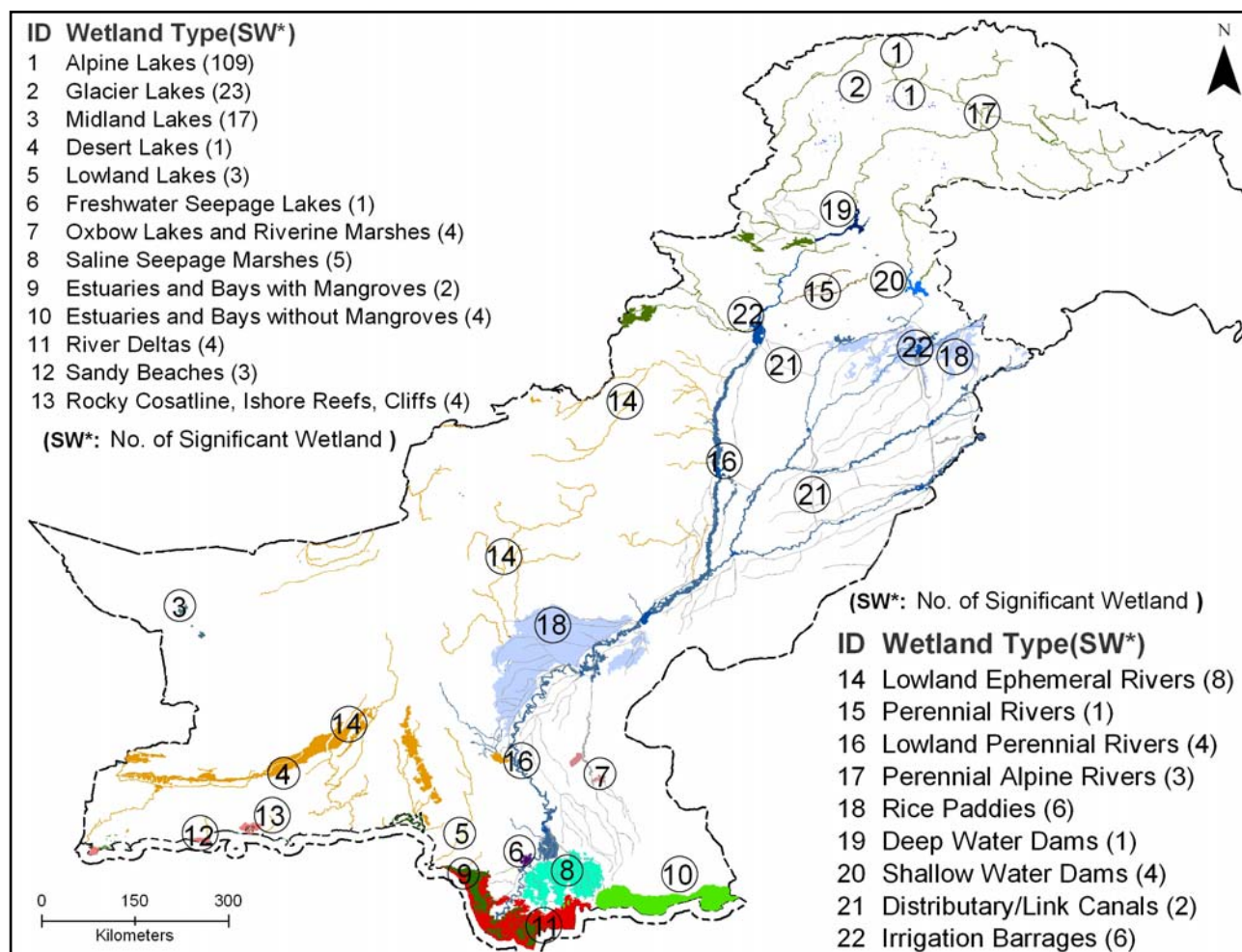


Figure 2: Major wetlands types of Pakistan

1.5 Issues and problems of the wetlands in Pakistan

Pakistan’s wetlands and associated *flora* and *fauna* are facing a wide range of threats that can be categorised into three major groups; (1) **Unsustainable anthropogenic use of wetlands**: these activities include the over-exploitation of wetlands resources such as destructive fishing practices, over-harvesting of wetlands vegetation, over-grazing and illegal hunting of birds, mammals and reptiles. (2) **Physical changes to wetlands on an ecosystem level**: land reclamation, deforestation, expansion of agricultural fields in the close vicinity of wetlands and over-gazing are causing much severe structural threats to wetlands. (3) **Off-site activities that cause physical and chemical changes to wetlands**: these are practices that do not take place directly on or around wetlands and carried out in some other locations but they have significant impacts on wetlands. Threats of this category include the changes in water volume like water flow and water pollution.

1.6 Gaps and weaknesses in the Policy Environment / Legislation

Pakistan has a difficult policy environment. This is particularly true of policy level interactions and planning interventions associated with environmental protection, conservation, or recognition of poverty-environment linkages. However, the situation is changing. In recent years, the

Government of Pakistan have initiated policy and planning measures to rectify the situation. However, appropriate institutional design remains missing particularly in terms of delineation of authority, adequate resource provision (human, physical, financial) and accountability mechanisms. The Government of Pakistan has through the Poverty Reduction Strategy Paper and the 10th 5-year Development Plan, also known as the 'People's Development Plan' (formerly the Medium Term Development Framework 2005- 2010) attempted to integrate environment in its long-term planning documents. However, this recognition of the importance of conservation and the value of environmental sustainability remains restricted to specific sectors such as agriculture, water, pollution, and forest (and associated natural resources). The activities and programmes proposed in these documents fail to make the link with appropriate poverty environment indicators and present a fractured image of state level natural resource management.

Policy documents such as the National Conservation Strategy (1992), the National Environmental Action Plan (2001), the National Environmental Policy (2005) and the proposed National Water Policy play an important role in describing the state's perspective on environment and natural resource management. They provide a roadmap for future policy and practical engagements. However, concrete impacts of these policy documents, the actions and planning trajectories they outline remain nebulous.

The Government of Pakistan is party to 5 natural resource related Conventions i.e. Convention on Biological Diversity (CBD), UN Convention to Combat Desertification (UNCCD), Convention on Migratory Species, Ramsar Convention on Wetlands, and Convention on International Trade of Engendered Species of Wild Fauna & Flora (CITES). In addition to these Conventions, Pakistan is also an active party to UN Forum on Forests (UNFF). While at the federal level, there is some awareness and understanding of the obligations, duties and opportunities emanating from these agreements but at the provincial and district levels, stakeholders, responsible for actively implementing targeted actions, collecting necessary data etc in line with these agreements remain largely uninformed.

In terms of legislation, the cornerstone of Pakistan's environmental legislation is the Pakistan Environmental Protection Act of 1997. The Act works under the presumption of environmental federalism wherein it creates the authority for the delegation of environmental management functions and powers to Environmental Protection Agencies at the provincial level. The provincial governments, in turn, have the authority to further delegate these powers. They also have the scope to adopt more stringent environmental regulations rather than adopt the bare minimum of standards and engage in a race to the bottom. The presumption of environmental federalism is further supplemented by the Local Government Ordinance of 2001. The Ordinance promotes responsibility and accountability at the local level and was designed to engage citizens in public political life from the smallest unit of government – the Union Council.

While the benefits of environmental federalism are plentiful, its application in Pakistan remains challenging on two fronts. First, the Pakistan Environmental Protection Agency remains charged with developing appropriate oversight and monitoring guidelines for the functions and activities of all provincial environmental protection agencies. Second, the Pakistan Environmental Protection Agency is responsible for building capacity and allocating sufficient resources to provincial agencies necessary to meet their delegated responsibilities. In general terms, government institutions, ministries, departments and associated public bodies are responsible for enforcing policies and ensuring the appropriate implementation of sanctioned plans. However, in order to do this effectively, institutional mandates need to be clear and transparent and implementing bodies require sufficient human, physical, and financial resources buttressed by legislative authority. Finally, an effective and transparent accountability mechanism should exist to evaluate institutions on how effectively they meet their respective mandates and utilise their resources.

The preceding discussion holds true for the Province of Punjab. Linking environmental conservation and sustainable natural resource use, Punjab's wealth of natural resources and diversity of ecosystems is a significant part of its overall development, particularly since large rural populations is dependent on these natural resources for their livelihood. Deterioration of these natural assets such as reduction in freshwater flows, habitat destruction, deforestation, pollution, water logging and salinity may be indicative of poor natural resource management, weak enforcement of environmental protection legislation, and feeble policy actions. Both civil society and several government departments exhibit a grave lack of awareness of environmental laws and rights. While this may be attributed to the fact that environmental law is a comparatively new area in Pakistan; it should also be attributed to poor dissemination of information and outreach. One of the cross cutting issues that affect forest and wildlife management in Pakistan is the existing legal framework which does not provide incentives for the local communities and corporate sector on the one hand, and provides no scope for the adoption of emerging concepts and management innovations. Moreover, the laws are obsolete in terms of the fines levied and the penalties imposed for poaching, fishing during prohibited seasons, infrastructure development in protected areas, unsanctioned logging, encroachment on forested land and other protected areas etc.

1.7 Pakistan Wetlands Programme: concept and design

However, these precious habitats are facing severe threats of degradation due to human interference, over-exploitation and mismanagement, which demands special cure. In order to safeguard and protect these precious wetlands, the World Wide Fund for Nature Pakistan (WWF – P) in consultation with other partner organisations in the year 2000 undertook wetlands conservation initiatives, which resulted in the form of an inception of the Pakistan Wetlands Programme (PWP) in 2005.

The overall aim of the PWP is to promote wetlands conservation and their associated globally significant biodiversity through poverty alleviation of wetlands dependent human communities. In order to achieve the major aim of the project, two major set of objectives were defined:

- Create and maintain an enabling environment for effective and sustainable conservation of natural wetlands at federal, provincial / territorial and local levels through public awareness, capacity-building and identifying gaps in policy and legislation at national level;
- Implement sustainable wetlands conservation at four representative sites that will serve as replicable models for subsequent nationwide wetlands conservation initiatives through development and application of wetlands management plans;

1.7.1. What is a Management Plan?

The management plan is a product of the planning process, documenting the management approach, the decisions made, the basis for these, and the guidance for future management for an entire PA over a given period of time. It should contain information on what is to be achieved by management and the rationale behind the management decisions made. The management plan can be defined as:

“a written, circulated and approved document which describes the site or area and the problems and opportunities for management of its nature conservation, land form or landscape features, enabling objectives based on this information to be met through relevant work over a stated period of time” (Eurosite, 1999)

These should be succinct documents identifying key features of the site, clearly establishing management objectives based on the associated risks and threats, the number of competing interests, the level of stakeholder involvement and the associated social issues and indicating

actions to be implemented. The task of preparing plans is challenging, keeping in view the multiple objectives i.e. biological and cultural, a wide array of social preferences and values, institutional structures and barriers, philosophical outlooks, forms of knowledge and conflicting opinions. In addition, plans also need to be flexible enough to cater for unforeseen events which might arise during the duration of the Plan.

The level of operational detail to include in a management plan is a decision for the respective Department to determine. How detailed the plan should be in terms of its operational content will most probably depend on whether there are other systems set up within the Department or whether the management plan is expected to provide the detailed day-to-day guidance to the Park authority.

The need for having a management plan is emphasised by the following statement:

“If there is no general management plan; preservation, development and use activities in a Park will occur in a haphazard basis, often in response to political pressures with little consideration as to the implications for the future. This result is likely to be lost opportunities and irreversible damage to park resources and values”

1.7.2. Wetlands Complexes Management Plans

The four wetlands complexes (Fig. 3) were included as part of the PWP after a series of consultation with national, provincial and local stakeholders. The sites were specifically chosen to be broadly representative of prevailing conditions and typical wetlands conservation problems in each of four separate ecological regions. These wetlands complexes include:

- Northern Alpine Wetlands Complex (NAWC)
- Salt Range Wetlands Complex (SRWC)
- Central Indus Wetlands Complex (CIWC)
- Makran Coastal Wetlands Complex (MCWC)

The major aim of each of the wetlands complex is to sustainably conserve wetlands biodiversity by designing and implementing a comprehensive management plan.

1.8 Wetland Protected Areas of the Salt Range

The Salt Range Wetlands Complex includes 5 significant lakes comprising of Uchhali, Khabekki, Jahlar, Nammal and Kallar Kahar wetlands. The first three lakes are part of the Uchhali Wetlands Complex, which is also notified as a Ramsar Site. A series of other small dams and adjacent small lakes exist in the premises of Salt Range region including Lava Lake, Dharab Dam, Dhok Talian Dam, Khokhar Zair Dam etc. but the major concentration of wetlands dependent biodiversity is found in the five significant lakes.

1.9 Management Plan for Salt Range Wetlands Complex

Salt Range Wetlands Complex is one of the four hotspots identified by the Pakistan Wetlands Programme. A series of site specific management plans are developed under the overall umbrella of Salt Range Wetlands Complex. The Uchhali Wetlands Complex is located in cup-shaped Soon Valley of District Khushab, Punjab province. The entire wetlands complex has been notified as a Ramsar Site and two out of three lakes of the complex are notified as Wildlife Sanctuaries, with Uchhali Lake as a Game Reserve. There is a need to develop individual site specific management plans because of the diversity in the nature of the terrain, issues, stakeholder involvement and objectives of management.

1.10 Wetlands management plan for Kallar Kahar Lake

Kallar Kahar Lake, which is notified as a Game Reserve, is located in District Chakwal. The management issues, biodiversity and the nature of stakeholders are different, so it needs to be dealt independently.

The management plan for the Kallar Kahar Lake will consist of a brief introduction to the area, details of Biophysical and Social Environment of the region, which also discusses the processes involved in data collection (useful for the development of a management plan), potential issues and threats faced by the wetland, overall management vision for the Lake, strategic interventions and the implementation and monitoring mechanism that not only defines the priority of an intervention but also the stakeholders involved in its implementation.

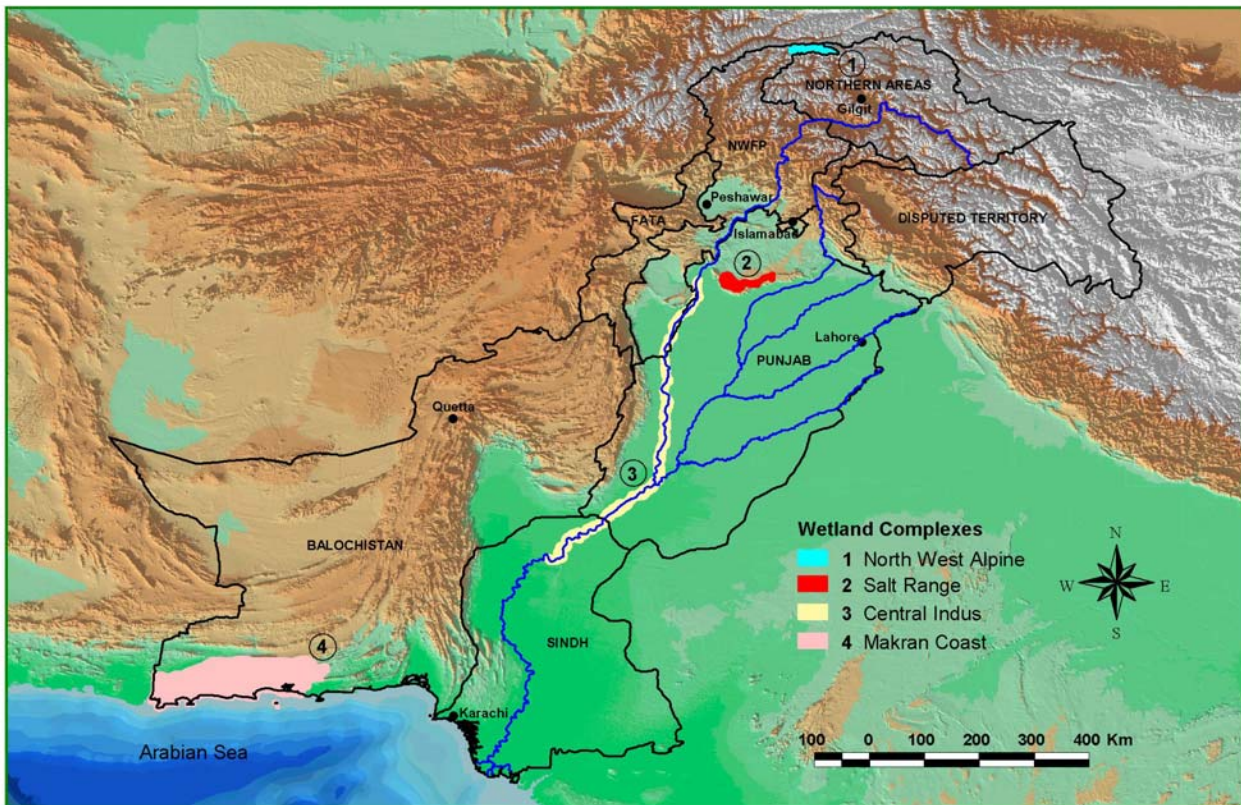


Figure 3: Four major wetlands complexes covered under Pakistan Wetlands Programme

2.0 Kallar Kahar Game Reserve

2.1 Introduction

Kallar Kahar is a union council and subdivision of Chakwal District in Punjab, Pakistan. It is a tourist destination and is notable for its natural gardens, peacocks and a saltwater lake.

Kallar Kahar Lake is a small brackish lake in the Salt Range, with an area of 85 ha. The Kallar Kahar Lake is located in District Chakwal, Punjab Province at a distance of 25 km north to Chakwal city. Kallar Kahar Lake is situated at a distance of about 135 km from Rawalpindi via Chakwal road whereas 100km from Islamabad by Motorway to the south and from Chakwal it is about 30kms to the south-west on Chakwal-Sargodha road. It is located between 32° 46' 30.31 North latitude and 72° 42' 23.80 East longitude at an altitude of 554 m above sea level (Fig. 4 and 5). The lake is located at the edge of Potowar Plateau and the Salt Range.

Kallar Kahar is an Inland permanent saline/brackish lake. It is fed by numerous freshwater springs at the base of hills. Runoff from catchment areas is also a source of water to the lake. Although, the water of the springs is fresh but salt in the bedrock of the lake turns it brackish. This spring water fills the lake up to a level and then overflows and makes a stream towards the north.

It offers a variety of attractions like scenic beauty, fruit orchards, spiritual sites and dancing peacocks. Therefore, the lake was developed by the Punjab Tourism and Development Department for recreational purposes such as boating and bird watching. Kallar Kahar Lake is one of the famous wetland areas in Pakistan and is an important site for migratory birds during winter season.

2.2 Historic significance

The great Mughal Ruler, *Zaheer-ud-Din Babar* visited this place in 1510 AD. During his stay at Kallar Kahar, Babar ordered the plantation of first *Mughal* Garden here and named it as *Safa* Garden or "*Bagh-e-Safa*", which still exists. A large single stone, elevated, carved out sitting place is also present in the garden, known as throne of *Babar* "*Takht-e-Babri*". This is a flat stage built of stone by Emperor Babar to address his army while coming down from Kabul in the quest of the crown of Delhi. In his memoirs, the *Tuzk-e-Babri*, Babar described Kallar Kahar as a "*charming place with good air*" and natural beauty.

2.3 Conservation status of Kallar Kahar

Kallar Kahar is notified as a Game Reserve under section 18 of the Punjab Wildlife (Protection, Preservation, Conservation and Management) Act, 1974, vide Notification No. SOP (WL) 12-22/2001, dated 13-02-2002, w.e.f 31-05-2006 till further orders.

According to the Punjab Wildlife (Protection, Preservation, Conservation and Management) Act, 1974, Game Reserve under Section 18 is defined accordingly:

- I. The Government may declare any area to be a "Game Reserve".
- II. No hunting and shooting of a wild animal shall be allowed in the "Game Reserve", except under a special permit, which may specify the maximum number of game animal that may be killed or captured, the area and duration for which such permit shall be valid:
 - a. Provided that the number of occasions on which hunting and shooting may be allowed shall not exceed two in a year.

2.4 Land tenure of Kallar Kahar Lake

The Kallar Kahar Lake is state-owned, whereas the local communities are the main stakeholders. Punjab Wildlife and Parks Department is responsible for controlling illegal hunting of wildlife especially the migratory waterfowls. Punjab Tourism and Resort Development Department is the major stakeholder for enhancing tourism opportunities and facilities in the region. City District Government of Chakwal is the main stakeholder who owns the land under water and responsible to control illegal encroachment surrounding the lake. The mandate of Environment Protection Agency, Punjab is to control pollution in the lake.



Figure 4: Location map of Kallar Kahar Lake



Figure 5: An overview of submerged vegetation in the inner peripheries of the lake

2.5 Principal Management Objectives of Kallar Kahar Lake

The principal management objectives of Kallar Kahar Game Reserve are to:

- Ensure the long-term conservation of the Kallar Kahar Lake and its associated wildlife and significant habitat;
 - Establish a baseline environment data set and maintain and improve an inventory for the wetland;
 - Enhance the quality of decision making and undertake effective liaison between the local government, concerned institutions and community regarding the appropriate environmental management for the area;
 - Buildup capacity and strengthen wetlands dependent communities in sustainable use of natural resources through enterprise development, improving their livelihoods and exploring alternative options of subsistence; and,
 - Develop and implement a Strategic Plan in collaboration with partners and local stakeholders.
-

3.0 Biophysical Environment

3.1 Introduction

Biophysical baseline studies were conducted in the year 2007 and further set the basis for the development of this management plan. Individual studies were conducted and specific threats and recommendations were noted down from field experiences, literature and extensive consultation with the communities and stakeholders.

3.2 Climate of the Region

The climate of the area is sub-humid sub-tropical continental type with hot to moderate summer and severe winter. The thirty-year average precipitation was 853 mm for the Salt Range region but is estimated 500 mm for Kallar Kahar. There are two distinct rainy seasons: the summer season or the monsoon rains start by about mid July and last until the mid of September. Most of the precipitation is received during July, August and September. The winter rains begin in January and persist up to beginning of March. May is the driest month of the year. The mean monthly temperature varies between 5.9 - 38.4°C, January being the coldest and June the hottest month of the year. During winters the temperature often drops to below zero, usually in December and January.

3.3 Geomorphology and Soils of Salt Range

Sedimentary rocks and preserved fossil records portray a complete picture of geological and biological history of the region. The severe tilting of these rocks during geological ages resulted in the exposure of these layers near the surface at many places (Shaw, 1989). Aridity prevailing in the area for major part of the year is the main climatic characteristic that affects its soils. This has resulted in limiting the soil moisture and scantiness of vegetative cover. The over use of vegetation has accelerated rates of erosion, resulting in bare sheet rocks devoid of any soil layers. The rocks are composed of limestone and sandstone or both. At some places infertile red marl is exposed due to similar reasons and the steep geological tilt resulting in frequent slips. Soils in Salt Range are rich in basic (rock salt) but poor in Nitrogenous matter. The exposed salt rocks get dissolved in water on rainy occasion and this dissolved salt later on deposits on faraway soil during runoff. The area is rich in minerals e.g. salt, coal, lime, different kinds of clay and gypsum.

3.4 Water quality monitoring

An in-depth analysis of surface and ground water resources was carried out in 2007 in order to establish benchmark for monitoring of physical and biological aspects of environment for the effective management of the lake. Water samples were collected from the two different locations of the Lake and analysed using physical, chemical and microbiological parameters. The procedures were adopted as specified by the American Public Health Association and the results were compared with the National Environmental Quality Standards, USEPA standards and WHO standards.

3.4.1. Surface Water Quality

The surface water quality analysis was carried out to determine the suitability of water for aquatic flora and fauna, and to determine pollution load in the surface water, which could affect the ecology of the water body.

Few parameters of surface water quality such as pH, temperature, Dissolved Oxygen (DO), conductivity etc. were analysed at the spot with the help of appropriate calibrated instruments

and the Hydro Lab MS-5. For remaining parameters, water samples were stored in sterilised bottles and analysed in the Lab.

Surface water analysis of the Kallar Kahar Lake showed the presence of physical, chemical and microbiological contaminations. A total of 37 parameters including, pH, EC, temperature, zinc, chloride, nitrate, cadmium, BOD, COD, DO, fluoride, iron, lead, nickel, salinity, sulphates, TDS, TSS and Total Coliform and Fecal Coliform were analysed. Few of them were found above or closer to the NEQS, USEPA and WHO standards. Use of fertilisers, pesticides and sewage discharge in and near the study area can be linked to the high chemical contamination levels.

Water temperature at Kallar Kahar Lake was recorded at 28°C with the help of an appropriate thermometer. The pH value of 9 was also recorded. Dissolved Oxygen (DO) (about 4.0 mg/l to 6.2 mg/l) was recorded at different sampling locations and considered as quite stressful for aquatic life. DO is a very important indicator of a water body's ability to support aquatic life.

Primary pollutants like Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) were also found slightly higher than expected figures due to discharge of municipal and industrial effluents. High levels of SO₄ were also observed and can be linked to the presence of sewage discharge into the Lake. High concentration of TDS observed in the samples depicts the incapability of water for drinking purposes. Other water contaminants like ammonia, chlorine, phenolic compounds, oil & grease, arsenic etc. were either remained un-detected or detected in low concentrations.

Strictly defined toxic metals such as barium, boron, cadmium, chromium, copper, manganese, mercury, selenium, nickel and silver were either remained un-detected or they were recorded in low quantities to cause any adverse impacts on the environment and ecology. Microbiological analysis showed high number of colony forming and total *coliform* indicating microbiological contamination due to anthropogenic activities.

3.4.2. Ground Water Quality

Ground water quality in the close vicinity of Kallar Kahar Lake was analysed in order to determine its suitability for drinking purposes. Twenty six (26) parameters of concern (physical and chemical elements) for drinking water quality were analysed. Microbiological analysis was also conducted to determine the quality of ground water for drinking purposes. Only one ground water sample was collected from a water pump in the Kallar Kahar Village near the Lake. The test results for drinking water were compared with World Health Organization (WHO) drinking water guidelines.

Detailed physical and chemical analysis of ground water indicated extremely high concentration of fluoride in the ground water, which was recorded above the WHO recommended values (recorded 4.9 mg/l as compared to WHO limits of 1.5 mg/l). Fluoride concentration of approximately 1.0 mg/l in drinking water effectively reduces dental caries without harmful effects on teeth and body. Sources of fluoride to water are erosion of natural deposits and discharge from fertilizer and aluminium factories.

High concentration of Sodium and Potassium was also observed in the ground water mainly due to sewage discharges and extensive use of fertilizers in adjacent agricultural lands and can also be linked to the geographic location and erosion of salt deposits and minerals. The hardness of water due to calcium and magnesium was also high probably due to the geographical location of the area. All other chemical and physical parameters were found in reasonable ranges. Arsenic, Turbidity, Sulphides and Odour were found below the detection limits.

The results showed the presence of biological contamination in ground water due to anthropogenic activities in the area. Relatively high concentration (higher than WHO standard limit) of microbial content in the water was recorded. The presence of total coliform in water

was a result of agricultural and domestic discharges. However, fecal coliform was not detected in the water samples taken from Kallar Kahar Lake.

It is therefore, concluded that the quality of ground water apart from microbiological contaminations and higher concentration of fluoride is tolerable and can be used for drinking purposes.

3.5 Flora of Kallar Kahar Game Reserve

The vegetation of the area is dry-sub tropical evergreen scrub forests characterised by open grasslands intermingled with scattered shrubs and dwarf tree species. Vegetation of the area is divided into two main categories:

3.5.1. Terrestrial vegetation

Terrestrial vegetation of Lake Kallar Kahar of the Salt Range was studied during 2007. The vegetation of the area is subtropical scrub type with scattered broad-leaved trees, shrubs and a basal grass cover. However the vegetation around the lake was modified due to abundant soil moisture and water salinity.

The line transect method was used to study the phytosociology of the lake area. Seven transects were laid around 7 sites of the lake, which included the lake bed, the plains area surrounding the lake and the hilly area adjacent to the lake.

The vegetations in the lake-bank sites was dominated by grasses *Phragmites karka*, *Heteropogon*, *Cynodon dactylon*, the sedge *Fimbristylis dichotoma* and the cattail *Typha domingensis*. Chenopods *Kochia indica* and *Suaeda fruticosa* were also present as co-dominants. All these species are resistant to water-logging and salinity. No trees were observed in this sub-zone.

The plain area situated near the lake was dominated by grasses *Cynodon dactylon* (Khabbal), *Brachiaria ramosa* and the broad-leaved weed *Conyza bonariensis*. The trees of this site were *Ziziphus mauritiana*, *Morus nigra* and *Eucalyptus citriodora*. Many herbaceous species were present in this site, e.g. *Cannabis sativa*, *Parthenium hysterophorus*, *Malvastrum coromandelianum*, *Datura innoxia*, *Oxalis corniculata*, *Amaranthus viridis* and *Aerva javanica*, etc.

The communities recorded from the hilly sites facing the lake were dominated by the grasses *Chrysopogon serrulatus*, *Apluda mutica* and *Heteropogon contortus*. Being protected these grasses grew luxuriantly forming dense clumps on the hill slopes. Shrubs *Justicia adhatoda*, *Dodonaea viscosa*, *Asparagus gracilis*, *Opuntia dillenii*, etc. were also common. *Dalbergia sissoo*, *Acacia modesta*, *Prosopis juliflora*, *Morus nigra*, *Eucalyptus citriodora* and *Eriobotrya japonica* were the trees present in the hilly areas. Broad-leaved herbs were also frequent in these sites.

A total of 51 plant species belonging to 27 families were recorded from the area. Poaceae was the largest family contributing 11 species of grasses. Asteraceae contributed 4 species; while Amaranthaceae, Chenopodiaceae and Cyperaceae were represented by 3 species each. Asclepiadaceae, Liliaceae, Malvaceae, Mimosaceae and Papilionaceae had 2 species each. The rest of the families were represented by one species each. Study of the life forms of the species revealed that there were 8 (16%) species of trees, 9 (18%) shrub species, 18 (35%) perennial and 16 (31%) annual herbs.

Acacia modesta (*Phulai*) was the most common tree of the entire area. Other common trees were *Eucalyptus citriodora* (*Safeda*), *Morus nigra* (*Toot*), *Dalbergia sissoo* (*Tali*, *Shisgam*), *Melia azedarach* (*Dhrek*), *Ziziphus mauritiana* (*Ber*), etc. *Fimbristylis dichotoma*, *Phragmites karka*, *Typha domingensis*, *Dodonaea viscosa* (*Sanattha*), *Justicia adhatoda* (*Bhaiker*), etc. were the common shrubs of the study area. Eleven species of grasses were recorded from the

area, which not only play an important role in the ecosystem of the area, but also provide fodder to the domestic livestock of the region. Because of high salinity of the lake, a number of halophytic species were noted, e.g. *Suaeda fruticosa*, *Kochia indica*, *Heliotropium curassavicum*, *Prosopis juliflora*, etc.

Justicia adhatoda (Bhaiker), *Asparagus adscendens* (Musli Safed), *Malva parviflora* (Sonchal), *Tribulus terrestris* (Gokhru), etc are used medicinally by the locals. *Amaranthus viridis* (Chulai), *Chenopodium album* (Bathu), etc. are used as vegetables.

3.5.2. Algae / Phytoplankton and Aquatic Vegetation

Qualitative and quantitative determinations of Algae are essential for determining the aquatic productivity as algae is the main source of food for aquatic animals including fishes. Algae are important groups of Cryptogamic flora, while some species are excellent and others are good producers of food in the food cycle of aquatic ecosystems. Algae is widely distributed and is an important component of various ecosystems like marine, rivers, ponds, streams, dams, lakes etc. Algal flora is also good indicator of pollution.

An ecological survey of algal species from freshwater of Kallar Kahar Lake, Salt Range, Punjab was carried during 9th August 2007. A total of 30 algal/phytoplankton samples were collected with the help of boat using phytoplankton net of 5-10 µm mesh. Water samples were collected each time using water sampler (Nansen bottle) for studying physico-chemical features using standard methods (APHA, 1985) and for identification of phytoplankton.

A total of 121 algal species belonging to 47 genera of 8 phyla (Cyanophyta, Volvocophyta, Bacillariophyta, Xanthophyta, Dinophyta, Euglenophyta, Chlorophyta and Charophyta, were recorded. Out of the total, 62 species (51.1%) belong to 20 genera of phyla Cyanophyta, 17 species (14.1%) belong to 4 genera of phyla Volvocophyta, 22 species (18.1%) belong to 12 genera of phyla Bacillariophyta, 2 species (1.7%) belonging to one genus of phyla Dinophyta, 4 species (1.3%) belong to 2 genera of phyla Xanthophyta, 6 species (5%) belong to 2 genera of phyla Euglenophyta, 6 species (5%) belong to 4 genera of phyla Chlorophyta and 2 species (1.7%) belong to 1 genus of phyla Charophyta, were recorded.

Water is rich in primary productivity of algal/phytoplankton species. The abundance of Algal species is due to the abundance of gasses, which is beneficial for aquatic organisms, fish and other fauna etc. Temporarily algal species/phytoplankton disturbs aquatic life due to tides which results in turbid water with suspended salt, material, silt and sand particles. However, difference species have different importance values especially some species are useful for medicinal purposes, nitrogen fixing, vitamins, toxic, for oil, pollution, water quality, hardness, salinity, alkalinity as well as for producing food.

As a whole blue green algal species were dominant throughout the lake which are second colony of food for aquatic life, fauna, fishes etc.

3.6 Fauna of Kallar Kahar Game Reserve

3.6.1. Large Mammals of Kallar Kahar Game Reserve and surrounding areas

Large mammal survey was conducted in the surrounding hills of Kallar Kahar during 2007. The major objective of large mammal census was to enlist and describe existing species of large mammals, their abundance, diversity, and habitat in the study area.

Direct sighting as well as indirect methods i.e. signs of their presence in the study area, were used during the survey. Transect lines of less than one kilometre length were studied which were further subdivided into less than 500 meters. Each transect line was recorded by Geographical Position System. In addition, survey was conducted on 4x4 vehicles from

09:00 pm to 01:00 am with vehicle speed maintained at 10-15 Km/hr to maximise the chance of sighting. A survey of the entire habitat was also conducted.

Few large mammal species were recorded through direct observations, but signs of presence of other species were also recorded from the area. The direct sightings include endemic Punjab Urial (*Ovis vignei punjabiensis*), Asiatic Jackal (*Canis aureus*) and Cape hare (*Lepus capensis*). Punjab Urial is endangered and its population has declined significantly in its natural home range. The other two species are fairly common in the area. Other mammal species found in the area include Chinkara or Indian Gazelle (*Gazella bennettii*), Red Fox (*Vulpes vulpes*), Indian or Bengal Fox (*Vulpes bengalensis*), Yellow-throated Marten (*Martes flavigula*) and wild boar (*Sus scrofa*).

3.6.2. Small mammals of Kallar Kahar Game Reserve and surrounding areas

Small mammals include the non game wildlife and hence unfortunately are given less attention. They however, form an indispensable component of the fauna of any ecosystem. They hold an important position in the interlocking web of eating and being eaten and therefore play an important role in determining the holding capacity and supporting the number of animals at different trophic levels of the food chain. The rodents, the insectivores, the bats, the mongooses, and the hedgehogs all not only ensure the ecological balance required for any self sustained ecosystem but also play their specific role in the biological control of that area.

These small animals fill almost every niche and depend upon variety of food submerged roots, fallen seeds, rhizomes and bulbs, insects, snakes, scorpions, spiders and beetles. The diversity in the feeding habits of these animals has multiple implications. They feed on insects and as a result control the insect population and agriculture pests of the area at one hand and on the other hand they consume grains, rhizomes, underground or submerged roots and are serious agriculture pests that inflict substantial damage to the farmers. But in the living system of nature no component operates in isolation. There are enough predators like foxes, Jackals, cats, owls, wolves, lizards and above all snakes, which feed on small mammals and bring the population of these animals to a sustainable level as they are being eaten up by other animals living in that particular ecosystem.

Small mammal survey was conducted during August 2007 in the surrounding areas of Kallar Kahar Game Reserve. The major aim of the survey was to collect data on species occurrence, abundance and diversity in the core and buffer zones and finally prepare a taxonomical checklist of all the species present in the region.

A mixture of different food grains mixed with fragrant seeds was used as bait for the attraction of the small mammals. Sherman and snap traps and mist nets were used for the present studies to collect the specimens.

Fifty traps were set at a specific area on a line approximately 500 m long and traps were set approximately 10 m apart. Each trap was marked by a colourful ribbon to locate the traps easily. The traps were set in the afternoon and checked early in the morning. The specimens were transferred in a polythene bag and were identified in the field and released. The specimens with some doubt were preserved in 10 % formaline and brought to laboratory and identified using identification keys. Snap traps were also used in selected areas. Fifty traps were set along a line transect of 250 m with each trap 5 m apart.

A total of 15 different species were recorded from the Kallar Kahar area and its surroundings belonging to five Orders and 11 families. In addition, their feeding habits and activity patterns were also recorded. Six species belong to Order Rodentia, 3 species belong to Order Carnivora,

2 species belong to Order Insectivora, one species belonged to Order Lagomorpha and three species belong to Order Chiroptera. A list of species found in the area is described in Table 1.

Table 1: Small mammals found in the Kallar Kahar Game Reserve and its surrounding areas

#	Scientific Name	Order/ Family	English Names	Local name	Feeding Habit	Activity Pattern
1	<i>Bandicota bengalensis</i>	Rodentia/Muridae	Indian Mole Rat or Rice Rat	Fusli Choooha	GRN	NC
2	<i>Golunda ellioti</i>	Rodentia/Muridae	Indian Bush rat	Choooha	GRN	NC
3	<i>Mus musculus</i>	Rodentia/ Muridae	Common House mouse	Choohi	GRN	NC
4	<i>Rattus rattus</i>	Rodentia/ Muridae	Common Rat	Choooha	GRN	NS
5	<i>Funambulus pennantii</i>	Rodentia/Petromidae	Palm Squirrel	Gulehri	GRN	DR
6	<i>Hystrix cristatus</i>	Rodentia/ Hystricidae	Indian Crested porcupine	Seh	HER	NC
7	<i>Herpestes edwardsi</i>	Carnivora/ Herpestidae	Common Indian Mongoose	Neola	CAR	DR
8	<i>Herpestes javanicus</i>	Carnivora/ Herpestidae	Small Indian Mongoose	Neola	CAR	DR
9	<i>Vivera indica</i>	Carnivora/ Viveridae	Small Indian civet	Jungli Billi	CAR	NS
10	<i>Hemiechinus collaris</i>	Insectivora/ Erinaceidae	Long-eared hedgehog	Kundyara Choooha	CAR	NC
11	<i>Lepus nigricolis</i>	Lagomorpha/ Leporidae	Indian Hare	Khargoash	HER	NC
12	<i>Suncus murinus</i>	Insectivora/Soricidae	Indian Musk Shrew	Chchundar	INS	NC
13	<i>Pteropus giganteus</i>	Chiroptera/ Pteropodidae	Flying fox	Chumgadar	FRU	NC
14	<i>Scotophilus heathii</i>	Chiroptera/Vespertilionidae	Common Yellow-bellied Bat	Chumgadar	INS	NC
15	<i>Hipposideros cineraceus</i>	Chiroptera/ Hipposideridae	Least leaf-nosed bat	Chumgadar	INS	NC

GRN=Granivore, **CAR**=Carnivore, **HER**=Herbivore, **INS**=Insectivore, **FRU**=Fruitivore, **NC**=Nocturnal, **DR**=Diurnal, **NS**=Non-specific

3.6.3. Amphibians and Reptiles of Kallar Kahar Game Reserve and surrounding areas

Amphibians and reptiles are very important animals among the vertebrates. Amphibians show the transition of aquatic and terrestrial life. The animals that invaded land, reptiles were the first fully terrestrial forms of life. Apart from their impressive evolutionary history, they beautifully demonstrate different concepts of physiological and behavioural adaptation to different climates, from tropical forests to hot desert and marine to freshwater. They do not have the ability to travel long distances like birds and mammals. In response to any local environmental changes they respond quickly and therefore may act as excellent biological indicators.

Amphibians and reptiles are important components of any living system and play a key role in interlocking web of nature. At one end they prey upon insects and other invertebrates and therefore regulate the population of these animals and on the other hand they are also a major source of food for other carnivore species (birds and mammals). Their position in the ecological niche is so vulnerable that the survival and collapse of the whole energy cycle depends upon the presence and absence of the amphibians and reptiles. The existence and sustainable use of this biological resource is therefore imperative around the study site.

Unfortunately very little attention has been given to this aspect in Pakistan. The major hurdle presumably is the lack of sufficient expertise and awareness in this particular field. Moreover, our society in general and rural folk in particular is mostly repulsive and afraid of reptiles. The major objective of this study was to collect data on amphibian and reptilian species occurrence, abundance and diversity in the study area and finally prepare a taxonomical checklist of all the species and their status in the study site. The animals were recorded through active searching,

trapping and their indirect signs during August 2007. Both diurnal and nocturnal surveys were arranged and every possible method was employed for the observation and collection of amphibians and reptiles.

Out of 35 possibly occurring amphibian and reptilian species of the area, 12 species were observed or collected. The remaining species have been recorded through secondary data obtained through discussions with the local inhabitants and consulting the previous literature citations. The amphibians are represented by six species belonging to six genera and three families. Among the reptiles, chelonians are represented by a single species belonging to family Trionychidae. Lizards outnumber all the groups of reptiles in the study area and are represented by 15 species belonging to 12 genera and six families. Snakes are the second dominant group of herptiles represented by 13 species belonging to 12 genera and six families. Table 2 presents a comprehensive list of species observed/ collected during field studies of 2007 and those from literature, which are earlier, reported from the nearby areas.

Table 2: Amphibian and Reptilian species of Kallar Kahar Game Reserve and its surrounding areas

#	Species Name	Taxonomic Position	English /Vernacular Name	Activity Pattern	Status	Feeding Habits
1	<i>Bufo stomaticus</i> * (Lütken, 1862)	Class: Amphibia Order: Anura Family: Bufonidae	Marbled Toad/ Daddoo	Non-specific (Mostly nocturnal)	A	Insectivore
2	<i>Hoplobatrachus tigerinus</i> * (Daudin, 1803)	Class: Amphibia Order: Anura Family: Ranidae	Bull-frog/ Daddo	Nocturnal	C	Insectivore
3	<i>Euphlyctis c. cyanophlyctis</i> * (Schneider, 1799)		Skittering frog/ Daddoo	Non specific (mostly nocturnal)	C	Insectivore
4	<i>Fejervarya limnocharis</i> ** (Boie, 1834)		Alpine cricket frog/ Daddo	Nocturnal		Insectivore
5	<i>Sphaeroteca breviceps</i> ** (Schneider, 1799)		Burrowing frog/ Daddoo	Nocturnal		Insectivore
6	<i>Microhyla ornata</i> ** (Dumèril & Bibron, 1841)		Class: Amphibia Order: Anura Family: Microhylidae	Ant frog/ Daddoo	Nocturnal	
7	<i>Lissemys punctata andersoni</i> ** (Webb, 1980)	Class: Reptilia Order: Chelonia Family: Trionychidae	Indian flap-shell/ Karkooma	Diurnal		Omnivore (mostly carnivore)
8	<i>Eublepharis macularius</i> ** (Blyth, 1854)	Class: Reptilia Order: Sauria Family: Eublepharidae	Fat-tail gecko/ Bindowa	Nocturnal		Insectivore
9	<i>Calotes v. versicolor</i> * (Daudin, 1802)	Class: Reptilia Order: Sauria Family: Agamidae	Indian garden lizard/ Sedar	Diurnal	C	Insectivore
10	<i>Laudakia m. melanura</i> ** (Stoliczka, 1872)		Black rock agama/ Sedar	Diurnal		Insectivore
11	<i>Trapelus agilis agilis</i> ** (Oliver, 1804)		Brilliant agama/ Korr Kirili	Diurnal		Insectivore
12	<i>Hemidactylus flaviviridis</i> * (Rüpell, 1835)		Class: Reptilia Order: Sauria Family: Gekkonidae	Yellow-bellied house gecko/ Korr Kirili	Nocturnal	A
13	<i>Hemidactylus brookii</i> ** (Gray, 1845)	Spotted Indian house gecko/ Korr Kirili		Nocturnal		Insectivore
14	<i>Cyrtopodion scaber</i> * (Heyden in: Rüpell, 1827)	Keeled rock gecko/ Korr Kirili		Nocturnal	R	Insectivore
15	<i>Cyrtopodion montiumsalsorum</i> ** (Annandale, 1913)	Salt-range ground gecko/ Korr Kirili		Nocturnal		Insectivore

#	Species Name	Taxonomic Position	English /Vernacular Name	Activity Pattern	Status	Feeding Habits
16	<i>Acanthodactylus cantoris</i> ** (Günther, 1864)	Class: Reptilia Order: Sauria Family: Lacertidae	Indian fringe-toed sandy lizard/ Kirili	Diurnal		Insectivore
17	<i>Mesalina watsonana</i> ** (Stoliczka, 1872)		Long-tailed desert lacerta/ Kirili	Diurnal		Insectivore
18	<i>Ophisops jerdonii</i> * (Blyth, 1853)		Punjab snake-eyed lacerta/ Guddi	Diurnal	C	Insectivore
19	<i>Eutropis dissimilis</i> * (Hallowell, 1860)	Class: Reptilia Order: Sauria Family: Scincidae	Striped grass skink/ Kirili	Diurnal	C	Insectivore
20	<i>Ablepharus pannonicus</i> ** (Fitzinger, 1823)		Red-tailed snake- eyed skink/ Kirili	Diurnal		Insectivore
21	<i>Varanus bengalensis</i> * (Daudin, 1802)	Class: Reptilia Order: Sauria Family: Varanidae	Bengal monitor/ Gho	Non specific (mostly diurnal)	A	Carnivore
22	<i>Varanus griseus koniecznyi</i> ** (Mertens, 1954)		Indo-pak desert monitor/ Gho	Non specific (mostly diurnal)		Carnivore
23	<i>Leptotyphlops macrorhynchus</i> ** (Jan, 1862)	Class: Reptilia Order: Serpentes Family: Leptotyphlopidae	Beaked thread snake/ saanp	Non specific		Decompose org. matter
24	<i>Ramphotyphlops braminus</i> ** (Daudin, 1803)	Class: Reptilia Order: Serpentes Family: Typhlopidae	Brahminy blind snake/ saanp	Non specific		Decompose org. matter
25	<i>Eryx johnii</i> ** (Russell, 1801)	Class: Reptilia Order: Serpentes Family: Boidae	Indian sand boa/ Doomoi	Nocturnal		Carnivore
26	<i>Amphiesma stolatum</i> ** (Linnaeus, 1758)	Class: Reptilia Order: Serpentes Family: Colubridae	Striped keel-back/ saanp	Diurnal		Carnivore
27	<i>Platyceps v. ventromaculatus</i> ** (Gray and Hardwicke, 1834)		Glossy-bellied racer/ saanp	Nocturnal		Carnivore
28	<i>Platyceps r. rhodorachis</i> ** (Jan, 1865)		Cliff racer/ saanp	Diurnal		Carnivore
29	<i>Ptyas m. mucosus</i> * (Linnaeus, 1758)		Rope snake or Dhaman/ Dadmaar	Diurnal	A	Carnivore
30	<i>Spalerosophis atriceps</i> ** (Fischer, 1885)		Red-spotted diadem snake/ Sat Garrhi saanp	Nocturnal		Carnivore
31	<i>Xenochrophis p. piscator</i> ** (Schneider, 1799)		Checkered keel-back	Non specific		Carnivore
32	<i>Bungarus c. caeruleus</i> ** (Schneider, 1801)	Class: Reptilia Order: Serpentes Family: Elapidae	Indian or common Krait/ Sangchoor	Nocturnal		Carnivore
33	<i>Naja n. naja</i> * (Linnaeus, 1758)		Black Cobra/ Chalyap	Non specific (mostly diurnal)	R	Carnivore
34	<i>Echis carinatus sochureki</i> * (Stemmler, 1969)		Sochurek's saw- scaled viper/ Pissi	Nocturnal	A	Carnivore
35	<i>Daboia r. russelli</i> ** (Shaw and Nodder, 1797)	Family: Viperidae	Russell's chain viper/ Dhai Garrhi	Nocturnal		Carnivore

Abundant (A) = Collected/ observed at more than 5 sites
Common (C) = Collected/ observed at 2-5 sites
Rare (R) = Collected/ observed at single site
(*) = Species observed/collected by the author
(**) = Species reported in literature/ secondary data

3.6.4. Avifauna of the Kallar Kahar Game Reserve and surrounding areas

The Kallar Kahar Lake was surveyed during August 2007 and the major objective was to enlist bird species of the Lake and its catchments area and to assess the population status of resident bird species. The Kallar Kahar Lake and catchment area were visited in early morning and late evening to record bird species. Point count method (Bibby and Burgess, 1992; William and Sutherland, 1996) was used to estimate density of the species. The data was collected from twenty randomly selected points from the lake and its adjoining catchment area.

Altogether, 60 bird species belonging to 14 orders and 36 families/subfamilies were recorded (Table 3). The largest family was *Ardeidae* with nine species. The Lake is famous for Indian Peafowl, which is often encountered around the lake and it enjoys protection due to the presence of a shrine. Among the recorded birds, 74% were found resident species.

The dominant species were House Crow (11.96), Common Sparrow (9.39), Common Myna (9.12), Red-wattled Lapwing (8.72), Cattle Egret (4.99) and Common Swallow (4.99 birds/ha). The least encountered species were Black-shouldered Kite, Common Koel, Pheasant Crow, Coppersmith Barbet, Yellow Wagtail, Large Pied Wagtail, Indian Tree Pie, Ruffous-backed Shrike, Blue Whistling Thrush and White Eyed.

The Salt Range has rich and varied bird fauna that belongs to Oriental, Palaeartic and Ethiopian regions. Majority of the recorded resident species were Oriental in origin.

Resident Species: Among the resident species, House Crow, House Sparrow, Common Myna, Indian Kite, Purple Sunbird, Red-vented Bulbul, White-cheeked Bulbul, Red-wattled Lapwing, Black-winged Stilt, Cattle Egret, Pond Heron, Black Drongo, were very common. Black-shouldered Kite, Common Kestrel, Grey Partridge, Pheasant Crow, Blue Whistling Thrush, Hoopoe, Black Partridge, White-breasted Kingfisher, Brown-rock Chat, Bush Chat, Magpie Robin, Indian Nightjar, Tailor Bird, Indian Reef Heron, Coppersmith Barbet and White-Eyed were recorded as rare in the area.

Purple Moorhen, Large Egret are **local migrant** as described by Roberts (1991).

Among the **summer visitors**, Little Green Bee-Eater, Common Koel, Golden Oriole and Blue-tailed Bee-Eater, were recorded; only Little Green Bee-Eater was found in good numbers, while all other recorded as rare/occasional birds.

Among the **passage migrant**, only Grey Heron was recorded, it is also considered as winter visitor to Pakistan.

Among the **winter visitors**, Coot, Common Pochard, Common sandpiper, Mallard, Ruffous-backed Shrike, Common Teal, Indian Redstart, Yellow Wagtail and Large-pied Wagtail were recorded.

Table 3: List of birds observed at Kallar Kahar Game Reserve and its surrounding areas

Order	Family	Scientific Name	English Name	Habits	Breeding	Status	Density/ha
Accipitriformes	Accipitridae	<i>Elanus caeruleus</i>	Black shoulder Kite	R	+	C	?
		<i>Milvus migrans</i>	Indian Kite	R	+	C	0.39
Anseriformes	Anatidae	<i>Anas crecca</i>	Common Teal	W	-	A	?
		<i>Aythya ferina</i>	Common Pochard	W	-	A	?
		<i>Anas platyrhynchos</i>	Mallard	W	-	A	?
Caprimulgiformes	Caprimulgidae	<i>Caprimulgus asiaticus</i>	Indian Nightjar	R	+	C	?
Charadriiformes	Recurvirostridae	<i>Himantopus himantopus</i>	Black-winged Stilt	R	-	A	1.36
	Charadriidae	<i>Hoplopterus indicus</i>	Red-wattled Lapwing	R	+	A	8.72
		<i>Charadrius dubius</i>	Little Ringed Plover	R	+	C	?
	Tringinae	<i>Actitis hypoleucos</i>	Common Sand Piper	W	-	C	?
Ciconiiformes	Ardeidae	<i>Egretta garzetta</i>	Little Egret	R	+	C	?
		<i>Bubulcus ibis</i>	Cattle Egret	R	+	C	4.99
		<i>Egretta intermedia</i>	Intermediate Egret	R	+	F	?
		<i>Egretta alba</i>	Large Egret	LM	-	C	?
		<i>Egretta gularis</i>	Indian Reef Heron	R	-	C	?
		<i>Ardea purpurea</i>	Purple Heron	R	?	C	1.02
		<i>Ardea cinerea</i>	Grey Heron	W/PM	?	C	?
		<i>Nycticorax nycticorax</i>	Night Heron	LM/R	+	C	?
Columbiformes	Columbidae	<i>Streptopelia decaocto</i>	Ringed or Collard Dove	R	+	A	0.79
		<i>Streptopelia senegalensis</i>	Little brown Dove	R	+	A	?
Coraciiformes	Alcedinidae	<i>Halcyon smyrnensis</i>	White breasted Kingfisher	R	+	C	?
	Meropidae	<i>Merops orientalis</i>	Little green Bee-eater	SM	+	A	3.96
		<i>Merops philpinus</i>	Blue-tailed Bee-eater	SM	-	C	?
	Upupidae	<i>Upupa epops</i>	Hoopoe	R	-	C	?
Cuculiformes	Cuculidae	<i>Eudynamys scolopacea</i>	Common Koel	SM	-	C	?
		<i>Centropus sinensis</i>	Pheasant Crow	R	+	C	?
Falconiformes	Falconidae	<i>Falco tinnunculus</i>	Common Kestrel	R	-	C	?
Galliformes	Phasianidae	<i>Francolinus francolinus</i>	Black Partridge	R	+	R	0.41
		<i>Francolinus pondicerianus</i>	Grey partridge	R	+	C	1.02
		<i>Pavo cristatus</i>	Indian Blue Peafowl	R	+	R	0.59

Order	Family	Scientific Name	English Name	Habits	Breeding	Status	Density/ha
Gruiformes	Rallidae	<i>Gallinula chloropus</i>	Water hen or Moorhen	R	+	A	0.11
		<i>Porphyrio porphyrio</i>	Purple Moorhen	Lm	+	C	0.82
	Turnicidae	<i>Fulica atra</i>	Coot	W	-	A	0.32
Piciformes	Capitonidae	<i>Megalaimahaema cephal</i>	Coppersmith Barbet	R	-	C	?
Podicipediformes	Podicipedidae	<i>Tachybaptus ruficollis</i>	Little Grebe	R	+	C	0.39
Passeriformes	Corvidae	<i>Corvus splendens</i>	House Crow	R	+	A ⁺	11.96
		<i>Dendrocitta vagabunnda</i>	Indian Tree-pie	R	+	C	?
	Dicruridae	<i>Dicrurus macrocerus</i>	Black Drongo	R	+	A	3.26
	Estrildidae	<i>Lonchura punctulata</i>	Spotted Munia	R	?	F	0.36
	Hirundinidae	<i>Hirundo rustica</i>	Common Swallow	W/R	-	A	4.99
	Laniidae	<i>Lanius schach</i>	Ruffous-backed Shrike	W	-	F	?
	Motacillidae	<i>Motacilla flava</i>	Yellow Wagtail	W	-	U	?
		<i>Motacilla maderapatensis</i>	Large pied Wagtail	R	+	U	?
	Nectariniidae	<i>Nectarinia asiatica</i>	Purple sunbird	R	+	C	0.26
	Oriolidae	<i>Oriolus oriolus</i>	Golden Oriole	SM	+	C	?
	Passeridae	<i>Passer domesticus</i>	Common Sparrow	R	+	A ⁺	9.39
	Ploceidae	<i>Ploceus philippinus</i>	Indian Baya	R	?	A	0.21
	Pycnonotidae	<i>Pycnonotus leucogenys</i>	White cheeked Bulbul	R	+	A	3.79
		<i>Pycnonotus cafer</i>	Red vented Bulbul	R	+	A	4.39
	Sturnidae	<i>Acridotheres tristis</i>	Common Myna	R	+	A ⁺	9.12
	Sylviidae	<i>Orthotomus sutorrus</i>	Tailor bird	R	?	C	?
	Turdidae	<i>Cercomela fusca</i>	Brown Rock Chat	R	?	F-S	?
		<i>Myiophoneus caeruleus</i>	Blue Whistling Thrush	R	-	C	?
		<i>Phoenicurus ochruros</i>	Black or Indian Redstart	W	-	C	0.17
		<i>Copsychus saularis</i>	Magpie Robbin	R	?	S	?
<i>Turdoides caudatus</i>		Common Babbler	R	+	A	1.32	
Turdinae	<i>Saxicola caprata</i>	Pied stone-chat or bush-chat	R	+	C-A	?	
Zosteropidae	<i>Zosterops palpebrosa</i>	White-eyed	R	+	A	?	

Habit: R = resident, W = wintering, I = irregular year round visitor, OM = ordinary migrant, V = vagrant, SM = summer migrant, PM = passage migrant
Breeding: + = breed in the area, - = does not breed in the area
Status: A = abundant, A⁺ = very abundant, F = frequent, C = common, U = uncertain, S = scarce, SR = scare becoming rare, R = rare F-C = frequent to common, C-A = common to abundant

3.6.5. Fish Fauna of the Kallar Kahar Game Reserve

Survey of fish fauna was undertaken during August 2007 and the major objective was to enlist and describe existing fish species in the lake and to prepare a taxonomical checklist of all the species.

There are five techniques for fish surveys viz., Bankside counts, trapping, cast netting, gill netting and electrofishing. Bankside counts are only done on the banks of clear shallow streams. Trapping is done by using specific baits for specific species, Gill netting is mostly for large sized commercial fishes while electrofishing is done only in wadable streams with limited width.

Sampling was carried out in selected areas covering all the representative habitats of the study area. Fishes were collected using cast nets so that the fish fauna of all the age classes could be collected. Ten nets of each mesh size were casted on four sides of lakes along a line transect of about 200 meters.

The fish fauna of the Salt Range as a whole has never been fully described. Day (1872) made only a cursory remark about the fishes from Choa Saidu Shah and some adjoining streams. Hora (1923) listed all the species then known from the Salt Range and described the following species collected by him from Pind Dadan Khan Tehsil of Jhelum District. The species include: *Garra montissalsi* Hora, *Scaphiodon readingi* Hora, *Labeo sindensis* (Day), *Crossocheilus latius* (Hamilton), *Barbus terio* (Hamilton), *Barbus punjabensis* Day, *Barbus for* (Hamilton), *Barilius vagra* (Hamilton), *Noemacheilus punjabensis* Hora and *Ophiocephalus gachua* Hamilton.

Out of the three new species described by Hora only one, viz., *Noemacheilus* (Schistura) *punjabensis*, seems to be a valid species, while *Scaphiodon readingi* and *Garra montissalsi*, have been merged with *Cyprinion watsoni* (Day) and *Garra gotyla* (Gray) respectively by subsequent authors (Berg, 1949; Menon, 1964; Mirza, 1969).

Purthi (1933) listed the following species from Khewra Gorge: *Barilius vagra* (Hamilton), *Barbus punjabensis* Day, *Chela punjabensis* Day, *Crossocheilus latius* (Hamilton), *Garra montissalsi* Hora, *Scaphiodon readingi* Hora.

3.6.5.1. Indigenous fish fauna of the Kallar Kahar Lake: Three species were recorded:

Cyprinion watsoni locally known as Sabzug

Crossocheilus latius locally known as Dogra

Puntius vittatus locally known as Popra

3.6.5.2. Introduced fish fauna of the Kallar Kahar Lake: Two species were recorded:

Two exotic species have been introduced in the lake for commercial utilization of the lake. The species are:

Cyprinus carpio locally known as Common Carp

Oreochromis mossambicus locally known as Tilapia

The Kallar Kahar lake supports, both, indigenous as well as exotic fishes. The exotic fish fauna are flourishing well in the lake and harvested by the fish contractor. The local fish fauna is also abundant and mainly represents the fish fauna of the Soan river.

3.7 Species of Global Significance

3.7.1. Punjab Urial (*Ovis vignei punjabiensis*)

The Punjab Urial (*Ovis vignei punjabiensis*) is endemic to northern Punjab, Pakistan, and is currently classified as endangered by the IUCN. The distribution of the animal in Pakistan is between the Indus and Jhelum rivers at elevations of 250 -1,500 m primarily in the Kala Chitta and Salt Ranges. The dominant habitat type in the area is Dry Sub-tropical Semi-evergreen Scrub Forest. Punjab Urial were once present over all northern Punjab Mountains, but in recent decades underwent a severe decline in both range and numbers, disappearing from much of their historic range.

3.7.2. White headed Duck (*Oxyura leucocephala*)

White headed duck (*Oxyura leucocephala*) is an important winter migrant to the Salt Range Wetlands in Pakistan. It is globally threatened species and its population has declined significantly in its entire range of distribution due to disturbance, habitat degradation and illegal hunting.

4.0 Social Environment

4.1 Introduction

The socio-economic study of Kallar Kahar Lake was conducted to determine the socio-economic conditions of the local people and their dependence on natural resources of the area. Both secondary and primary data was collected for the study. This data further helped in identifying major interventions for the development of Management Plan of the Kallar Kahar Game Reserve.

4.1.1. Secondary Data

The secondary data comprised literature review and maps to determine villages located near the wetland site. Three villages, Kallar Kahar, Chakora and Bokhni were selected for survey as they met the village selection criteria developed by the survey team. Primary data was then collected from households through a household questionnaire with an overall sample size of 14%. Data regarding the criteria for wealth classification and percentage of these classes was collected through focus group discussions. Information was also gathered from various government departments and NGOs using a semi-structured questionnaire. Rapid Assessment and Prioritisation of Protected Areas Management (RAPPAM) methodology was applied to determine pressures and threats to the Protected Area (PA) along with its current management conditions regarding finances, staffing, socio-economic importance etc. The original RAPPAM questionnaire was modified according to the conditions of the Kallar Kahar Game Reserve to gather information about this PA from relevant people.

4.1.2. Primary Data

Primary data consisted of semi-structured interviews with government officials and NGOs, household survey with the help of structured questionnaires, direct field observation and data collection through RAPPAM technique.

4.1.3. Household Survey

A structured questionnaire was developed for the HH survey to gather qualitative and quantitative information regarding socio-economic conditions of the village, amenities available in the village, economic condition of the local people, means of livelihood and their dependence on the Game Reserve. To gather information, priority was given to those HHs that were more dependent on the natural resources of Kallar Kahar Lake and its surrounding areas.

4.1.4. Government Departments and NGOs

Various government departments and a local NRSP office were visited to gather information about the identified villages and Kallar Kahar Game Reserve. Semi-structured interviews were conducted with representatives of these departments and organisations.

4.2 Issues identified by the communities

Data collected during the survey revealed that the selected villages of Kallar Kahar Lake were deprived of basic facilities such as gas supply, clean drinking water and proper waste management system. Most of the households used fuelwood for heating and cooking. The dependence of the local population on *Shamlat* and *Rakh* forests for fuelwood collection is putting indirect pressure on the Kallar Kahar Lake in terms of vegetation loss and soil erosion.

Tourism is the major activity in and around the area. Tourism provides an alternate source of livelihood for the locals but, at the same time, also exerts considerable pressure on the natural resources of Kallar Kahar Lake. Other pressures on the lake include: decrease in the water level, due to siltation and over-extraction of the ground water; fishing contracts;

organic and inorganic pollution due to lack of proper waste management and poor sanitation system; and encroachment towards the boundaries of the lake.

4.3 Rapid Assessment and Prioritisation of Protected Areas Management

RAPPAM methodology has been developed by WWF-International and is used globally to assess the condition of various Protected Areas. It looks at the effectiveness of the Protected Area and helps in identifying the pressures and threats along with weaknesses in management of the Protected Area.

The questionnaire is divided into 10 sections. The first identifies pressures and threats along with their extent, severity and impact while the remaining nine sections deal with different aspects which include socio-economic importance, vulnerability and objectives of Protected Area, legal security issues, management planning and decision making, issues related to staffing, finances and research, evaluation & monitoring conducted in the Protected Area.

This methodology is an effective tool for Protected Area managers and policy makers, which help them, identify management steps to ensure fully functioning of Protected Areas.

4.3.1. Management objectives and aims

The first section of the RAPPAM questionnaire includes general questions to identify the Protected Area and to determine specific management objectives and critical management activities being carried out in the Protected Area. Kallar Kahar was originally designated as a Wildlife Sanctuary but in February 2002, its status was changed to Game Reserve.

The overall goal of declaring a site as a Protected Area is protection of important species of *flora* and *fauna*. The strategies adopted for management describe the management objectives. The specific management objectives of Kallar Kahar Game Reserve are conservation of migratory birds and wetlands conservation against all harmful practices in collaboration with local partners and other stakeholders.

The activities conducted in a Protected Area to prevent any irreplaceable damage or unacceptable loss to its resources and habitat are included in critical management. Control of illegal hunting and habitat management are the critical management activities being undertaken in the Kallar Kahar Game Reserve.

4.3.2. Pressures and Threats

The respondents identified pressures and threats to the Protected Area as well as their trend, extent, impact and permanence. Tourism, fishing, sewerage water and encroachment were identified as the four main pressures and threats to Kallar Kahar Game Reserve.

4.3.3. Scoring of Pressures and Threats

The respondents identified various pressures and threats. In order to identify the greatest pressure on and threat to the natural resources of the Kallar Kahar Game Reserve, each pressure was given a score on the basis of data obtained and then ranked accordingly. For example, the extent category has been ranked as: Localised = 1; Scattered = 2; Widespread = 3; and Throughout = 4.

Mass tourism occurs in Kallar Kahar Game Reserve which puts excessive pressure on its natural resources and was scored highest. Over the past five years, this activity has increased significantly and the probability of its occurrence in future is high. If tourism activity continues at this scale, its impact would be high.

Fishing activity was scored at the second highest level which is being carried out in Kallar Kahar Game Reserve on a commercial scale and for recreation. Out of the three respondents, only two identified it as a pressure and as a threat. This activity would have a long-term, if not permanent, impact on Kallar Kahar Game Reserve.

Sewage of villages, shops, guest houses and other commercial places enters directly into the Kallar Kahar Lake. This causes water pollution and is a pressure currently being exerted on the lake. Villages' size and tourism activity is increasing. Over the last 5 years, disposal of untreated sewage into the lake has increased correspondingly. Currently the impact of this pressure is mild but if this trend continues, its impact could become high.

Land encroachment was also considered one of the pressure and a threat. In order to facilitate tourists, many shops, guest houses, rest houses, hotels, etc. have been constructed in the area adjacent to the lake. According to the respondents, this activity, having a severely adverse impact on the area, has increased significantly in the last 5 years. The impact of this pressure would be permanent. The probability of occurrence of land encroachment over the next five years is high and it would occur throughout the area.

Most of the respondents identified sewage water disposal and fishing as the only threats and pressures to the lake. Noise pollution, caused by the construction of Motorway and tourism, has also been rated as pressure and as threat.

Disposal of sewage water and solid waste has caused eutrophication of the lake. It is constantly exerting pressure on it. This activity has increased slightly over the last few years and is impacting the lake moderately.

The collection of *Typha spp.*, *Saccharum spp.*, and *Phragmites spp.* by the local population has a moderate impact on the natural resources of the area.

Various developmental activities e.g. construction of rest houses, industrialisation and urbanisation of the area, are exerting pressure on the lake. Such activities have increased during the last five years.

4.3.4. Socio-economic Importance

Analysis revealed that the Kallar Kahar Game Reserve has great socio-economic importance, as it is a major source of employment for the local communities. It has a high cultural and religious value due to *Takht-e-Babari* and a *Darbar*. Freshwater springs, *flora* and *fauna* add to the aesthetic importance of the lake. This Protected Area was rated high because of its recreational, scientific and educational value.

4.3.5. Vulnerability

According to the respondents, illegal activities in Kallar Kahar Game Reserve can easily be monitored but due to weak law enforcement mechanism, the Protected Area is quite vulnerable. The reasons for this vulnerability are:

1. Market value of the natural resources of the Kallar Kahar Game Reserve is high.
2. It is easily accessible for illegal activities.
3. There is a strong demand for vulnerable resources.

4.3.6. Objectives

The answers regarding objectives of the Kallar Kahar Game Reserve yielded, more or less, consistent results. There is no specific management plan and hence no specific objectives for the Kallar Kahar Game Reserve since there is only one general management plan for all the Protected Areas of Punjab. The employees and administrators understand the overall objectives and policies of this Protected Area. The respondents awarded high score to the local communities' support of the overall objectives of the Protected Area.

4.3.7. Legal Security, Staffing and Finances

According to the last notification, Kallar Kahar will remain a Game Reserve until any further orders. It, therefore, has a long-term legal binding and protection. Staffing and financial resources are adequate to conduct critical management activities such as prompt detection

of illegal activities. The wages are not sufficient to retain a high quality staff. Due to lack of training and development opportunities, the staff lacks the skills to conduct critical management activities. The funds released for management activities, with a 10% increment each year, are not sufficient to conduct critical management activities. Most importantly, there is never any commitment for allocation of funds in the future.

4.3.8. Management Planning and Management Decision Making

As has already been stated, there is no specific management plan for Kallar Kahar Game Reserve but there is a clear internal management organisation. There is effective communication between the Protected Area staff and administration at all levels. The local communities do not have the right to participate in the decision-making process of the Kallar Kahar Game Reserve. According to the respondents, a comprehensive inventory of waterfowls of Kallar Kahar Game Reserve is available.

4.3.9. Research, Evaluation and Monitoring

The impact of legal and illegal use of natural resources of the Kallar Kahar Game Reserve are accurately monitored and recorded. Not much research is being conducted in the area regarding important ecological and social issues. The staff of the Protected Area has access to scientific research and advice but they hardly ever utilise it.

4.3.10. RAPPAM Analysis

The RAPPAM analysis revealed that a number of tourists visit the Kallar Kahar Lake throughout the year. Tourism puts the highest pressure on the resources of the Kallar Kahar and has been assessed as the most severe threat to the lake. The tourism activity is likely to remain high in the next five years.

Encroachment of land has been rated as the second highest pressure on the natural resources of the lake. Due to this activity, vegetation of the area is being removed which is also contributing to noise pollution. This activity has increased significantly over the last five years and, according to the respondents, the future trend of land encroachment would remain high.

The third in the ranking is fishing which continues in the area for recreation and commercial purposes. There is no proper sewerage system in the villages around the Kallar Kahar Lake. Sewage water of the adjacent villages, shops and rest houses is polluting the water of the lake and is a major cause of eutrophication.

There is no specific management plan for the Kallar Kahar Game Reserve. The general management plan for the PAs of Punjab is followed in this area. It has a long-term legal binding and protection but due to its high socio-economic importance, problems of staffing and financial constraints, it is quite vulnerable to illegal activities.

5.0 Potential Issues and Threats

5.1 Management Issues

5.1.1. Lack of coordination between various line departments

The land under the lake is state-owned, belongs to City District Government, Chakwal, and the adjoining areas of the lake are *Shamilat* or communally owned. The fisheries belong to Punjab Fisheries Department, whereas, *flora* and *fauna* belongs to Punjab Forest and Punjab Wildlife and Parks Departments respectively. Punjab Tourism and Resort Development Department is responsible for enhancing tourism facilities in the area, whereas the Punjab Environment Protection Agency takes care of the pollution related aspects and the Environmental Impact Assessments of the development project around the lake. Lack of coordination between these line agencies and their interests has affected the ecological integrity of the lake and its surroundings.

5.1.2. Weak law enforcement

Illegal hunting of waterfowls and large mammals in the catchment area, pollution entering into the lake from a broad range of human activities from the adjoining areas and illegal cutting of wetlands vegetation by adjacent communities are all examples of weak law enforcement in the area. In addition, the land encroachment and clearing of land for agriculture and construction purposes in the catchment area of the lake is a constant threat.

5.1.3. Lack of field equipment and technical skills of the field staff

During the time of preparation of this management plan, there are two dedicated Wildlife Watchers for the overall protection of the resources of the Kallar Kahar Lake, under the Salt Range Wildlife Protection Force, recently established by the Punjab Wildlife and Parks Department. In addition, a few check posts have also been established to stop illegal hunting and poaching of wildlife.

Lack of wireless communication between the staff located at various check posts and the field staff remains an issue to address the problem. The field staff is inadequately equipped with technical equipment e.g. binoculars, spotting scope, camera and GPS, which is a prerequisite of effective monitoring and management. In addition, the field staff does not have the capacity to record and subsequently report wildlife data on a regular basis. The mobility of the protection staff due to lack of transport facilities and the lack of security weapons at check posts also remains an issue.

5.2 Ecological Issues and Threats

5.2.1. Illegal hunting and poaching of wildlife

Hunting is probably one of the most cross-cutting issues that wildlife managers face in this country. Unless the hunting is for subsistence, most forms of the sport are carried out by the elite class who see themselves above the laws of the relevant Departments (and often this proves true).

5.2.1.1 Illegal hunting of large mammals in the catchment area: Illegal hunting of large mammals in the catchment areas seems to be a frequent occurrence. Endemic and threatened Punjab Urial (*Ovis vignei punjabiensis*), a species of special concern, has lost major proportion of its natural habitat due to habitat destruction and fragmentation due to number of reasons. The population numbers have also declined significantly and restricted to only small patches within the Salt Range due to illegal hunting, lamb capture and competition with domestic livestock.

5.2.1.2 *Illegal hunting of waterfowls:* Kallar Kahar Game Reserve is one the five important lakes of the Salt Range, which is the first staging ground for migratory birds during winter season. In addition, a number of important resident birds are found in the area, which is equally important for the ecology of the lake. Extensive hunting pressure has been observed during migratory season which not only disturbs their staging ground but also affects other *flora* and *fauna* of the lake.

5.2.1.3 *Retaliatory killing:* The local communities of the region are afraid of wildlife especially the reptiles including snakes and lizards and considers them as of no value. It has been observed that the communities try to kill every specimen which they encounter and which threatens their life. This has resulted in the reduction of wildlife.

5.2.2. Clearing of forest land from the catchment area

An approximately 2,000 households surrounding the Kallar Kahar Lake are dependent on the natural resources of the area for their domestic and commercial purposes. In addition, several businessmen have invested in the area due to an increase in tourism opportunities. The forests on the eastern hill sides of the lake are being regularly cut to clear the land for development of hotels, restaurants, recreational facilities and new housing schemes. For this purpose, they have cleared off the natural vegetation, altering the natural ecosystem, degrading wildlife habitat, introducing non indigenous species and causing many more adverse environmental impacts (e.g. agro-chemical pollution, siltation, loss of forest cover etc.), which is threatening the very existence of the Protected Area.

5.2.3. Extraction of fuelwood from the catchment area

Fuelwood extraction by the surrounding communities of the Game Reserve is a continuous phenomenon, as the area is deficient in cheaper sources of fuel and free fuelwood is readily available from the adjoining areas of the Lake. Major fuelwood used by the local people living on the periphery of this Game Reserve is *Olea ferruginea* and *Acacia modesta* and from the adjacent farm lands. Illicit cutting of adjoining forests for fuelwood has been severely affecting the catchment area of the Game Reserve, as well as habitat degradation.

5.2.4. Illegal livestock grazing in and around the Protected Area

Most of the local people generally graze their domestic animals in the adjacent areas of the lake and along the banks of the lake. Resultantly, there is a heavy grazing and fuelwood cutting pressure from the adjacent villages. Such an unrestricted grazing has been badly affecting the range ecology and its productivity, which is otherwise a vital habitat for Punjab Uril and other mammal species of the area. In addition, the large mammals are also facing threats due to an increased competition with domestic livestock.

5.2.5. Lack of information about the biodiversity of the area

The researchers, resident communities, stakeholders and the visitors from Lahore, Islamabad and other adjoining areas seriously lack up-to-date information and awareness about the unique wildlife species of the area and the role they play in the overall ecology of the Salt Range ecosystem.

5.2.5.1. *Lack of information on population status of key wildlife species:* Except a few targeted short-term studies on pollution, vegetation and waterfowl, there is no information regarding the population status of key wildlife species of the Kallar Kahar and its adjoining catchment area. Surveys are not conducted to determine the population trends.

5.2.5.2. *Lack of Information boards and material:* There is no information by the respective Departments installed in and around the Protected Area to aware the people regarding the region's biodiversity. These Departments are not considering the ecological role, value of the biodiversity and the importance of ecosystem of the Protected Area. Communities, having abysmal situation of literacy are also ignorant about the basic environmental phenomena and

its impacts on their lives, livelihoods and economy. A few information boards are installed by WWF-Pakistan in collaboration with other stakeholders to raise the awareness level of the general public but these are not enough to cover the entire Protected Area and to cater the needs of the tourists/visitors. There is no resource material published for the promotion of *flora* and *fauna* of the region for the general public.

5.2.5.3. Lack of eco-tourism facilities: There is no such facility such as a “bird hide” or watch tower established, where general public can appreciate the biodiversity especially the bird diversity of the region. There is absolutely no information available for identification of birds that are protected throughout the year and cannot be hunted even if the license is available.

5.2.5.4. Inadequate information dissemination mechanism: Keeping in view the great ecological significance of the area, there is no existing mechanism, from where the tourist can get information about the lake and its resources.

5.2.5.5. Inadequate awareness campaigns: General public including all major segments of the society are mostly unaware of the ecological role of the Kallar Kahar Game Reserve and its associated *flora* and *fauna* in the daily lives of the people. Except a few environmental awareness initiatives taken up by WWF-Pakistan during the year 1998-2002, local people and the schools children have little knowledge about the area’s ecological significance and its associated biodiversity.

5.2.6. Zonation of the Kallar Kahar Game Reserve

Due to a continuous increase in the local tourism in and around the lake, an associated problem of solid waste generation also exists. The lake is under the control of City District Government but the recreational and tourism facilities are being provided by the Punjab Tourism and Resort Development Department, which has not considered the importance and role of migratory birds and other *flora* and *fauna* species, dependent on the lake. Due to an increase in human interventions and interference in the lake e.g. paddle boats, *Typha* cutting etc. the visiting migratory birds are disturbed. There is no plan in place by respective line agencies for defining and core and buffer zones within the lake for protection of migratory birds and their habitat.

5.2.7. Introduction of exotic fish species

Two species of fish (Common Carp and Tilapia) have been introduced in the Kallar Kahar Lake. These species specially Tilapia has imposed a negative impact on major carps of Pakistan and their population has certainly declined. The Tilapia is a proliferate breeder and its population increases enormously. This rapid increase in population of this fish puts the local species in a strong competition for food, and breeding grounds. Kallar Kahar Lake, being declared as a Protected Area, the introduction of exotic species is not recommended and justified.

5.2.8. Presence of invasive species

The species of domestic animals such as cats and dogs are frequently met inside the boundary of the lake. The Punjab Wildlife (Protection, Preservation, Conservation and Management) Act 1974 clearly states that no species can be introduced in the Protected Area. In the adjoining catchment areas of the lake, *Dodonea viscosa* (Sanatha) has widely spread due to overgrazing and land degradation, which has not only altered the range ecology of the region but has also affected the lake’s biodiversity in the longer term.

The introduction of exotic and fast growing trees in and around the Protected Area leads to further deterioration of the existing habitats. The resident bird species cannot adopt the changing habitat conditions, which results in the dispersal of local species from the area.

5.3 Socio-economic Issues and Threats

5.3.1. Non biodegradable pollution originating from a broad range of human activities

5.3.1.1 Agro-chemical pollution: The agriculture runoff is posing a serious threat to the aquatic *flora* and *fauna*. The areas near the banks are facing problems due to heavy use of fertilisers and pesticides on the orchards. Farming community in buffer zone use a variety of chemical fertilisers and pesticides for enhanced crop and fruit production and pest control, respectively. These pesticides leach into the ground water and have potential harmful impacts on the water and through bioaccumulation can even impact endangered waterfowl species. There are a great number of insectivorous birds, which are greatly affected due to these insecticides. The Agriculture Department advises farmers to poison grains before sowing; this practice is fatal to the grainivorous birds of the Protected Area. Due to the lack of environmental awareness amongst the resident communities and general public, the ecological damage and human dangers of chemical pollution is increasing manifold.

5.3.1.2 Municipal pollution: Municipal pollution is increasing manifold generally due to the lack of proper management and inadequate technical capacity on part of the Environmental Protection Agency (EPA). It is disposed openly in heaps and was seen scattered along the banks of the lake. This waste not only provides an un-aesthetic look but is an excellent substratum for a variety of disease causing organisms. In addition, there is un-checked, untreated waste water and un-controlled domestic waste seepage into the lake from the surrounding residential area, which causes threat to *flora* and *fauna* of the lake.

It was noted that although the lake was valuable for the people as well as wildlife of the area, it was much polluted due to human activities. . As the lake is a well-known tourist spot, hotels are being run which dispose their effluents in the lake. In addition, increasing human interventions on the boundary of the lake by various businessmen, who are involved in providing tourism and recreational facilities, has resulted in generation of a large quantity of solid waste, which is either dumped on the boundary of the lake or in the wetland.

5.3.2. Encroachment into the lake

The businessmen including the hotel and guest house owners and others who are involved in similar activities around the lake are encroaching the land for several developmental purposes, which are ultimately affecting the ecology of the lake through pollution, solid waste disposal, excessive but irregular tourism development initiatives. The encroachment especially on the eastern aspects in the adjacent catchment areas has also affected the local *flora* and *fauna* of the area. Development of new housing schemes on the adjacent hills remains an issue and is a constant threat to the lake and its ecology. Every year more and more land in the surroundings of the lake is being cleared to make additional room for agriculture, fruit orchard development, livestock grazing and development of new housing schemes and hotel industry.

5.3.3. Poverty and limited livelihood opportunities

The Protected Area is an important source of livelihood for local people who meet their daily subsistence needs through various uses. Having scarcity of the diversified livelihood options in the face of rising poverty, local people illegally extract maximum resources e.g. fuelwood, NTFPs and forage to fulfil their domestic and other needs by earning money through the sale of the extracted resources. This phenomenon continues to be unattended and remains an issue, which has degraded the ecological integrity of the Kallar Kahar Game Reserve.

There is also a limited role of the communities in the overall planning and management of the resources of the Kallar Kahar Game Reserve. The respective line Departments have not

included locals in decision making which has resulted in the loss of natural resources of the Protected Area.

Missing link with urban market for promotion of fruit and community products: As far as marketing of fruit and community products are concerned, middle-men is involved which fetches very low income for communities. Selling these items directly in the market may bring in more earnings which is almost double the price. The main markets exist in Kallar Kahar, Jhelum, Rawalpindi / Islamabad, Chakwal and Lahore. The monthly income of a family strictly depends upon the season of fruits, quality of the fruits and also the availability of natural vegetation *Typha* and *Saccharum* from in and around the lake.

5.3.4. Diversion of water for fruit orchards and other agricultural uses

An extension of agriculture and other human interventions and uses in the areas around the lake has resulted in an increased diversion of water supplies for different uses with fewer run-offs reaching the lake. The quality and quantity of water is dependent on the amount of precipitation, which is the major controlling factor in the region.

5.3.5. Illegal cutting of wetlands vegetation for community-based products

Besides the use of wetlands vegetation as fuelwood, the cutting of *Typha* and *Phragmites* is also used for thatching and weaving of a range of community based products (foot mats, rugs, ropes, twines and baskets etc.), which has reduced the extent of breeding habitat for birds.

There are several community-based products on display in the market of Kallar Kahar, which normally are being extracted illegally and unsustainably from the lake. The lake is not only shrinking in its quality habitat but is also experiencing deterioration of water quality. This poses a serious health hazard to wildlife in general, and birds in particular.

In addition, there is very heavy grazing pressure on the damp grasslands near the lake. Due to a number of ecological changes mainly induced by human pressure, the health and very life of this lake is threatened. No doubt these resources are the primary sources of living and income for the local communities but its unsustainable harvest, as has been happening, may lead to disastrous socio-ecological consequences in the long run.

6.0 Vision for the Kallar Kahar Game Reserve

6.1 Strategic Objectives

6.1.1. Management Planning

Management planning is a subset of the more general discipline of planning, applied to PAs across the globe but with varying degrees of success. It is a tool rather a process for guiding Park authorities on how an area should be managed, today and in the future. This process does not end with the production of the plan, but it requires that on-going monitoring takes place to test the effectiveness of the plan. Lessons learnt from monitoring should be used to review the appropriateness of management purposes and policies. This feedback loop may thus lead to amendments to the original plan, to keep it on the right track, or in additions to the next version of the plan that is produced.

The time needed to prepare a Management Plan, for even a small site, is rarely less than 24 months due to the need for extensive consultations and surveys for addressing complex issues and subsequent drafting of the document. A realistic estimate of the time required should be made at the beginning of the process and allowed for.

Before embarking on the design of a Management Plan, a clear idea of the costs and available resources should be gathered, particularly where there are to be resource and user surveys, public consultation and engagement of consultants. A realistic appraisal needs to be made to ensure that all costs associated with the plan can be fully met, bearing in mind that the planning process may take some years to complete. In the case of Kallar Kahar Game Reserve, the financial allocations for the implementation of the management plan have been included in Pakistan Wetlands Programme to some extent. This further provides opportunities of implementation of interventions through partnerships and raising additional funds from national and international donors primarily to sustain PA operations and community interventions.

Management by objectives (Box I) is proactive rather than reactive and also 'results oriented' emphasising accomplishments and outcomes. Four distinct steps have been identified:

- Formulation of clear, concise statements or objectives;
- Development of realistic action plans and implementation guidelines;
- Systematic monitoring and measuring of performance and achievement through reviewing the action plans and the implementation status of the guidelines; and,
- Taking corrective actions necessary to achieve planned results.

Box I: Guidelines for a good Management Plan

A management plan should be:

- Clear and accessible: easy to read, jargon free and well presented;
- Concise and comprehensive: no longer than is absolutely necessary;
- Accurate and objective: without major errors or statements likely to date;
- Systematic and logical: with management policies derived from an assessment of the site;
- Acceptable and motivating to all those with interests in and emotional attachment to site;
- Precise and practical: with clear objectives, realistic methods for achieving them;
- Focused and effective: fulfilling its purpose as a tool for site management;
- Precise with flexibility;
- Comprehensive with simplicity; and,
- Management oriented with ease of understanding by the public.

6.2 Developing management vision for Kallar Kahar Game Reserve

The management planning process should develop and articulate an ideal condition, state or appearance for the future of the PA. Vision statements describe the desired or envisaged result of the policies for the conservation of the PA and provide coherent direction for management objectives. Importantly a vision statement should be aspirational and should:

- Describe the kind of PA that the plan is seeking to achieve in the long-term. This will help people to understand what it is hoped the area will be like in the future, the reasons for this, and the action needed to achieve the vision;
- Be a long-term statement which is unlikely to change significantly over time. It should therefore provide continuity in the process of managing PA in a sustainable way; and,
- Include environmental, recreational, cultural, social and economic aspects of the area.

The vision statement for Kallar Kahar Game Reserve is as follows:

Kallar Kahar Game Reserve is envisaged as the flagship of a system of Wetland Protected Areas in the Salt Range, where definitive measures are implemented to ensure the viability of the biological diversity and ecological processes according to the pre-set guidelines laid out in the management plan that also protects the heritage and enhances the livelihoods of local communities adjacent to the Protected Area.

Objectives follow from the management vision. They are more specific statements of intentions, setting out the conditions that management aims to achieve. To the extent possible, these objectives should be prioritised to guide subsequent decisions and there is a need to reconcile the different objectives through appropriate planning responses.

In developing initial management objectives (Box II), a three-staged approach can be used:

- Design overall management objectives;
- Develop issue-specific management responses; and,
- Prepare initial management options that define management interventions.

Box II: Guidelines for writing management objectives of the Protected Area

- Precise/specific;
- Measurable, achievable and realistic;
- Reflect PA purpose, significance and exceptional values;
- Spell out the ends desired, but not the means to those ends;
- Adequately address the issues;
- Accompanied by a rationale; and,
- Written in priority order.

6.3 Describing management objectives for Kallar Kahar Game Reserve

Typically the specific management objectives for Kallar Kahar Game Reserve would be formulated to cover the following major aspects of PA planning and management:

- Human resource management;
- Effective law enforcement;
- Establishment, up-gradation and maintenance of essential infrastructure and services;
- Wildlife management programmes;
- Ecological surveys and monitoring programme;
- Public information programme and awareness raising;
- Community outreach programmes;
- Research studies; and,
- Development of partnerships and linkages

6.3.1. Generic objectives of the Kallar Kahar Game Reserve's Management Plan

Keeping in view the objectives of the establishment of Kallar Kahar Game Reserve, following management guidelines are presented for the effective improvement of PA and its resources:

- To have management policies that are oriented towards the conservation of natural resources of the region in general and Kallar Kahar Game Reserve in particular, and are based on realities with sufficient flexibility to accommodate existing human uses until alternatives are available for local subsistence;
- To have clear, specific and problem-oriented management objectives for the Game Reserve which, if achieved, could greatly help in meeting the overall objective of the PA; and,
- To have specific and feasible management action programmes for achieving individual objectives of the plan that could be easily monitored and evaluated at various stages of implementation.

6.3.2. Specific objectives of the Kallar Kahar Game Reserve's Management Plan

The specific objectives of the Kallar Kahar Game Reserve's management plan for effective implementation of the policies, objectives and action programmes are mentioned below. Success indicators and timelines may be assigned to these objectives during the development of workplans.

- To provide guidelines and set priorities for a baseline biodiversity assessment and to make the data accessible to the stakeholders for future management and research;
- To provide management planning and operational guidelines to the PA staff for the achievement of specific objectives for enhanced management;
- To help implement existing wildlife legislation in addition to meeting international conservation obligations;
- To protect and improve local status of the wildlife species of the Game Reserve in general and endangered and flagship species and their associated habitats in particular;
- To maintain close liaison with PA authorities for the improvement of existing infrastructure, communication and administration for effective law enforcement;
- To provide opportunities for engaging communities in planning and management for effectiveness of the conservation and protection efforts in the Game Reserve;
- To create alternate sources of income and energy for the traditional users to improve their quality of life and minimise their subsistence and dependence on the natural resources;
- To help build the professional capacity of the staff for effective administration and natural resource management;
- To enhance eco-tourism and improve visitors' facilities and services;
- To help improve scientific research on species and habitat management;
- To explore new avenues for improved management of PA through developing partnerships and establishing linkages with local, national and international donors and partners; and,
- To enhance awareness of local communities and to build their capacity for improved resource management and exploring alternative livelihoods.

7.0. Process adopted for the development of Management Plan

7.1. Literature Review

An extensive literature review was carried out in order to collect relevant information for the site. All sources of information such as: WWF – Pakistan’s library, peer-reviewed research publications, Internet, previous records of Punjab Wildlife and Parks Department, Tourism Development Corporation of Punjab and Environmental Protected Agency, and other unpublished reports, were used to collect and analyse relevant information for the development of management plan for the site.

7.2. Ramsar Guidelines

Well established Ramsar Guidelines were followed for the development of this management plan. The Ramsar guidelines consisted of three different sections: (i) Description of the area, (ii) Evaluation and objectives; and, (iii) Action Plan. This process was adopted for the development of management plan of Kallar Kahar Game Reserve.

7.3. Environmental Baseline Studies

Environmental baseline studies were carried out by the Pakistan Wetlands Programme during 2008. This was the first ever comprehensive baseline assessment of the Protected Area which revealed significant hydrological, physical, ecological and socio-economic information. This sets the basis for most of the information being reflected in this document.

7.4. Field Observations and Meetings

WWF – Pakistan has been involved in the conservation and management of significant wetlands of the country through enhancing awareness, capacity-building programmes and improving management. The Pakistan Wetlands Programme has been working in this region and has its presence in the region for more than a decade in the Salt Range while working with communities and other government and non-government partners. During this time, several issues have emerged as a result of unsustainable use of the natural resources. These issues have been clearly highlighted in the present document.

7.5. Community Consultations and Partner Meetings

During the implementation process of the Pakistan Wetlands Programme, extensive consultations are being made, which has helped in redefining issues and the suggested solutions. Several detailed consultations with the staff of the Punjab Wildlife and Parks Department have already been organised but some issues still need more discussion as our knowledge and information improves. In addition, socio-economic assessment, community discussions and partner meetings helped in further redefining the priorities set in the current management plan.

8.0. Strategic Plan for Management

Kallar Kahar Game Reserve faces a number of anthropogenic pressures. Several pressures are rooted in social and economic issues that are far too wide ranging and endemic for any meaningful intervention at a site specific level. Poverty, for instance, is pervasive in the region as is social class. However, a few meaningful steps can still be initiated to promote an improved condition of the Kallar Kahar Game Reserve.

8.1. Management Interventions

8.1.1. Objectives of Management Interventions

The major objectives for these management interventions are to:

- Enhance coordination between various partners in wetlands conservation in order to effectively address site level management issues;
- Equip the field level staff of the Punjab Wildlife and Parks Department with necessary field equipment, mobility and security weapons for management of resources; and,
- Help build the technical skills and knowledge of the staff of government line agencies and other partners in improved management of wetlands.

8.1.2. Strategic Interventions

8.1.2.1. *Improving stakeholders coordination at the provincial level*

Establishment of Provincial Wetlands Management Committee: A Provincial Wetlands Management Committee needs to be formulated to promote wetlands conservation at the highest level within the province. This will not only facilitate the implementation of various wetlands related international conventions, national policies and provincial rules and regulations but will also effectively enhance coordination among various stakeholders in order to clarify their roles and responsibilities, which should be clearly defined in the Terms of References of the Committee. The Committee members include nominations from various Departments including Punjab Irrigation and Power Department, Punjab Forestry, Wildlife and Fisheries Department, Planning and Development Department, Punjab Tourism and Resort Development Department, Punjab Environmental Protection Agency and representatives of WWF-Pakistan under the Chairmanship of Provincial Secretary Forestry, Wildlife and Fisheries Department.

8.1.2.2. *Improving stakeholder coordination at the site level*

Establishment of Site Level Wetlands Management Committee: The Site Level Wetlands Management Committee will be formulated to help implement wetlands conservation interventions at the level of individual wetland. The Committee will be responsible for increased coordination at the site level which will promote partnerships and linkages in order to strengthen individual wetlands conservation. The Committee members include nominations from the local representatives of various Departments and community members preferably under the Chairmanship of respective Deputy Director Wildlife or District Coordination Officer (DCO), as wetlands conservation is the provincial agenda to be tackled by Punjab Wildlife and Parks Department but the local level initiatives has to be undertaken under the guidance of City District Government, Chakwal. The Terms of References for the Committee should be clearly defined in order to improve the status of wetland, which will meet more regularly to discuss management, ecological and social issues.

8.1.2.3. *Improving law enforcement in the area*

- At least two check posts with adequate field staff of the Punjab Wildlife and Parks Department need to be established for the protection of biodiversity of the Kallar Kahar Game Reserve against illegal poachers.

- Community-based watch and ward mechanism needs to be established in collaboration with Site Level Wetlands Management Committee through deputing additional Community Wildlife Watchers. The financial resources can be generated through various eco-tourism ventures in the area. This will not only promote community-based conservation in the area but will also develop a sense of ownership of the resources.
- Partnerships and linkages with local partners and stakeholders in addition to resident communities also need to be established to discuss harmful environmental concerns (e.g. pollution, illegal hunting, encroachment, illegal cutting of vegetation etc.) at the local level.

8.1.2.4. *Strengthening knowledge and technical capacity of the field staff*

- The field staff deputed by the Punjab Wildlife and Parks Department needs to be properly equipped and trained in wildlife identification, data recording and reporting, use of GPS, camera, binoculars and spotting scope.
- In addition, the field staff needs to be equipped with wireless communication and properly trained to effectively address the issues of illegal poaching and hunting. Transport facility should be provided to the field staff and equipped with security weapons at check posts to avoid illegal wildlife practices.

8.2. Ecological interventions

8.2.1. Objectives of Ecological Interventions

The major objectives of ecological interventions are to:

- Establish monitoring protocols for the regular assessment of ecological needs and upgrade information in the national and international databases regarding Kallar Kahar Game Reserve;
- Maintain and improve the ecological integrity of the Game Reserve through improved ecological interventions related to reducing harmful practices (pollution, hunting / poaching, illicit cutting, unsustainable extraction of NTFPs, encroachment etc.); and,
- Promote the sustainable use of natural resources for the local communities living in and around the Game Reserve.

8.2.2. Strategic interventions

8.2.2.1. *Promoting conservation and sustainable use of wildlife resources*

- *Protecting the declining populations of large mammals:* Periodic monitoring checks of the large mammals especially Punjab Urial needs to be carried out jointly by the staff of WWF-Pakistan and Punjab Wildlife and Parks Department. Organised Committees and partner organisations should be strengthened to effectively protect Punjab Urial against illegal hunting / poaching. There is a strong need to depute equipped field staff at already established check posts by the Punjab Wildlife and Parks Department, within the territory of Salt Range to stop illegal hunting and poaching. Community-based organisations should be strengthened in effective watch and ward mechanism through hiring community wildlife watchers at identified places of Punjab Urial habitat. In addition, the presence of Chinkara also needs to be confirmed in the catchment area of the Game Reserve, in collaboration with local stakeholders, as this species have significantly declined due to over-hunting in the Salt Range.
- *Promoting sustainable waterfowl hunting:* Regular awareness campaigns related to illegal sport hunting of Waterfowls need to be initiated. There is a need to organise a “*Waterfowl Sport Hunters Meet*” in collaboration with the senior staff of the Punjab Wildlife and Parks Department to discuss the issues of illegal waterfowl hunting in the province and to promote sustainable hunting with established hunting code of ethics. Regular contacts and dialogues needs to be maintained with the *Punjab Chapter* of the

Waterfowl Sport Hunters. Law enforcement and awareness raising initiatives need to be implemented jointly in collaboration with all stakeholders.

- *Raising awareness to reduce retaliatory killing:* Awareness level of the resident communities needs to be enhanced regarding the value of biodiversity of the Kallar Kahar Game Reserve and its surroundings. This could be achieved by installing information boards and printing of resource material for dissemination to the resident communities as well as to the visiting tourists. Reptiles are mostly killed as they are not liked by the general public but their role in the agriculture, controlling diseases and pests needs to be highlighted to conserve these species.

8.2.2.2. *Conserving catchment area of the Kallar Kahar Lake*

- Construction of new housing schemes, hotels and restaurants should be immediately stopped in order to protect the catchment area of the lake.
- Proper land use planning should be carried out immediately in order to define the boundaries of developed area (housing schemes, tourist hotels and restaurants, fruit orchards and agriculture crops) and the natural area (natural forests and associated wildlife).
- Environmental Impact Assessment should be carried out for any developmental initiative being planned in the catchment area of the lake.
- Illegal livestock grazing should be allowed on a rotational basis to enhance the growth of natural vegetation.
- Indigenous tree species should be planted in the catchment area in collaboration with Punjab Forest Department and other developmental partners.
- Multipurpose fast growing tree species should be planted at the farm level in order to reduce pressure on the natural forests for fuelwood collection.

8.2.2.3. *Improving and disseminating knowledge base of existing natural resources of the lake and its environs.*

- Population status of key wildlife species of the region needs to be established and monitored on a regular basis. Punjab Uril population should be monitored during lambing and rut season on an annual basis, whereas the migratory bird population in general and White-headed duck and other endangered species in particular should be monitored during migratory season. In addition, other large mammals, small mammals, fish abundance and diversity, changes in terrestrial and aquatic vegetation, population trends in resident and migratory birds and changes in water quality should be regular feature as part of this management plan. The information can be regularly updated in national and international inventories and databases for publications to reach wider audiences.
- Information boards displaying information about the Protected Area and the associated biodiversity needs to be installed at prominent locations for information to the visitors and general public. These information boards should also depict information on illegal hunting and poaching in order to reduce illegal practices in and around the Game Reserve. In addition, existing information boards regarding the area and its natural resources should be fixed for their effective display.
- In order to appreciate the bird diversity of the lake, there is a dire need to establish a bird hide with the existing Jetty, where the tourists and visitors of all ages and areas can visit the place. A mechanism will also be established to promote tours to the area and revenue will be generated, which will not only provide financial incentives to the communities but will also an opportunity to maintain and enhance eco-tourism facilities. In addition, several other initiatives related to tour guides, establishing and maintaining camping facilities

(restricted parking and camping places and toilets), bird watch tower and the concept of community guest houses and traditional foods, should be explored and implemented.

- There is a strong need to establish an Kallar Kahar Conservation and Information Centre in addition to Community resource Centre in order to promote the biodiversity of the area. This needs to be initiated in collaboration with Tourism Development Corporation of Punjab Ltd. and will be located within the premises of the TDCP. In this regard, an MOU will be signed to further define the roles and responsibilities of both the organisations.
- Effective school awareness campaigns should be initiated. This will include establishing nature clubs, presentations to school children, training to school teachers, celebrating significant environment days, outdoor activities, solid waste collection, disposal and management campaigns, waste dustbin campaigns, and visits to different regions within the Salt Range.

8.2.2.4. Zonation of the Kallar Kahar Lake

- Due to human disturbance and interference in the lake and its surroundings, there is a need to define the Kallar Kahar Lake into different zones for its effective management. As the lake is mostly used to promote tourism and recreation to a wide range of people, this aspect needs to be clearly defined and areas devoid of natural vegetation and bird hide need to be declared as recreational zone. Whereas the area which provides habitat and shelter to the resident and migratory birds especially on the right side of the Jetty, needs to be declared as the core zone for birds. A GIS map needs to be established at installed at prominent places for creating awareness for the visitors and resident communities.

8.2.2.5. Promoting indigenous flora and fauna in and around the Protected Area

- *Exotic fish species*: The introduction of exotic fish species within the Protected Areas should be discussed as one of the agenda items in the Provincial Wetlands Management Committee as well as Site Level Wetlands Management Committee to maintain and improve the ecological integrity of the wetland. In addition, the plantation of *Eucalyptus* species in the vicinity of the Kallar Kahar Lake is also not advisable because it is an exotic species and it affects the overall ecology of the area in the longer run.
- Indigenous species of flora e.g. *Olea ferrugenia* and *Acacia modesta* should be planted at open places in the catchment areas in order to reduce the expansion of invasive species such as *Dodonea viscosa* (Sanatha) and also to reduce soil erosion. This should be planned in collaboration with Punjab Forest Department and other partners working in the area.
- Plantation of the vegetation on communal lands with the participation of local communities can compensate for illicit cutting
- Communal Protected Areas can be declared in order to protect the indigenous natural resources of the area which will also ensure participatory approach

8.3. Social Interventions

8.3.1. Objectives of Social Interventions

Any efforts towards initiating community participation need to be carefully chosen with a long-term view rather than short-term project implementation aims. Communities in the region follow occupations that have been handed down to them over generations and with low literacy and few economic development opportunities, as there are limited alternatives for them. Any change in livelihoods initiated for the duration of a short-term project are likely to make little permanent mark on changing the extraction patterns that characterise anthropogenic pressure on the Game Reserve. Since the area is characterised by high levels of poverty, especially among communities that use the Protected Area's resources, promoting people's participation can play a key role changing the management and use of the Game Reserve.

The main objectives of Social Interventions are to:

- Organise local communities into Village level Wetlands Conservation Committees for improved management of the natural resources of the Kallar Kahar Game Reserve;
- Improve the social maturity of the established committees through registration as Community Citizen Boards (CCBs) for their efficient involvement and in improved management of the existing natural resources of the area;
- Promote collaborative management approaches with local communities through signing partnership agreements and dialogues to reduce harmful practices for improving biodiversity conservation and community development; and,
- Enhance conservation awareness level of the local communities living in and around the Protected Area for effective management of the resources.

8.3.2. Strategic Interventions

8.3.2.1. Involving local stakeholders in collaborative management of the natural resources

- *Village level Wetlands Conservation Committees:* Information of the existing Protected Area and the surrounding communities and other stakeholders should be mapped in order to define the boundaries of the project interventions. Initial contacts and dialogues should be made with local communities through existing CBOs and Village level Wetlands Conservation Committees (VWCCs) should be established. Separate women committees need to be established in order to recognise their specific role in wetlands resource use and management. A network of VWCCs need be established and partnership agreements should be signed for collaborative management of resources. Terms of References, Constitution and Nominations of the Committees should be developed accordingly.
- *Community Citizen Boards (CCBs):* The established VWCCs should be registered with the Social Welfare Department, District Chakwal, as CCBs to enhance their status based on their involvement, performance and maturity level. The CCBs should be provided training in Office and accounts management, proposal development, developing linkages and partnerships, field level implementation of interventions etc. to further strengthen their roles and responsibilities.

8.3.2.2. Alleviating poverty and improving alternative livelihood opportunities

- *Eco-tourism:* There is a need to develop a series of alternate livelihood development opportunities for the local communities. This may also include components of well organised eco-tourism options in the Sanctuary, which involves local communities to a great extent. This should be further enhanced by signing partnership agreements with Punjab Tourism and Resort Development Department and other Tourism related projects in the province. Kallar Kahar Game Reserve holds the potential to become a tourist spot as long as tourist numbers to the area are carefully controlled. It is fairly close to the Motorway and quite easily accessible to the residents of other big cities (Islamabad / Rawalpindi, Lahore) and adjoining areas. In particular, the area has attracted people for the lake and its ecology, fruit orchards, its historic importance and established tourism opportunities. However, the facilities for eco-tourism need to be further developed. Well-managed tourism can contribute to conservation while providing employment and revenue to the local communities. At a minimum, local people should be trained and hired as guides, their boats can be used in the lake, and as a support staff. Tourism must be managed to ensure that it does not contribute to environmental degradation or cultural disintegration. A portion of all profits should be invested in local conservation and social development. Programmes that use participating tourist to accomplish research and conservation goal should be encouraged.
- *Skill development for improving alternate livelihood opportunities:* Training should be imparted to local communities in various alternate livelihood skill development and

enhancement, establishment of fruit orchards, poultry farming, apiculture and kitchen gardening etc. in addition to the use of natural resource base products.

8.3.2.3. *Promoting sustainable extraction of Non Timber Forest Products*

- *Unsustainable use of Non Timber Forest Products:* A baseline assessment needs to be conducted to know the status and kind of communities involved in NTFPs for earning their livelihood. A comprehensive set of information needs to be developed e.g. list of natural resource based products, species used, area from where the NTFPs are collected, quantity of NTFPs collected, income generation from these products in order to appreciate the role of wetlands in livelihood generation, quality of products etc. This exercise would be helpful in improving the status of not only the vegetation being collected in and around the Protected Area, but will also help in devising a strategy for sustainable extraction of the NTFPs. The recommendations of the assessment will provide opportunities for the local communities to further improve and enhance their livelihood from natural resource based products.
- *Value Addition of NTFPs:* In order to reduce collection of *Typha*, *Phragmites* and *Saccharum* sp, a supply chain analysis of community products needs to be undertaken to identify potential areas for value addition to this activity and the findings can be incorporated in a small-scale business support venture to increase value. This could be tied to agreements on reducing extraction levels inside the Protected Area.

8.3.2.4. *Non-biodegradable Pollution originating from broad range of human activities*

- A preliminary assessment need to be conducted to determine the pollution loads in the Protected Area. Based on the detailed assessment of the area with regards to pollution, a pollution management plan should be developed keeping in view the international monitoring standards and protocols. This should include the source of pollution, kind of pollution, impacts on biodiversity, sampling and analysis, presentations to various stakeholders, partners involved in addressing the issues, options of treatment plants, recommendations for improvement or mitigation plan and an activity schedule for stakeholders to work on. This plan will address all issues related to agro-chemical pollution through Integrated Pest Management, chemical pollution and municipal pollution. This could be achieved in collaboration with Punjab Environment Protection Agency and WWF-Pakistan's Freshwater and Toxics Programme. Further, project proposals should be developed for implementation of the plan in collaboration with the partners. Partnership should be developed with other projects and programmes already initiated in the region.

8.3.2.5. *Encroachment:* There is a need to determine a baseline assessment of status of land encroachment inside the Game Reserve for different business and tourism purposes. In addition, there is also a need to determine the potential impacts on the wildlife of the region, which is being affected from illegal encroachment and habitat destruction as a result. Once the assessment is complete in all terms with the support of GIS facility, this could be discussed as one of the agenda items in the Provincial Wetlands Management Committee as well as Site Level Wetlands Management Committee in order to protect the ecological integrity of the Protected Area. In addition, awareness coupled with alternate livelihood opportunities for the local communities should be launched in order to reduce harmful practices within the premises of the Protected Area.

8.3.2.6. *Improving water flow to the lake:* The communities living on the edges of the Game Reserve needs to be made aware of the importance of water flow from springs to the lake, which is also a source of ground water recharge. Several channels originating from the nearby springs are being diverted for fruit orchards development but this water is needed by the lake to maintain its level, quality and quantity.

9.0. Implementation Plan

9.1. Summary of Interventions

There are 80 interventions that have been grouped together in three major components for effective implementation of the management plan for Kallar Kahar Game Reserve. These include Management interventions, Ecological interventions and Socio-economic interventions and are presented in the form of a matrix (Table 4). Table 4 not only describes the priority of an individual intervention (Low, Medium and High) but also describes the responsibilities of the primary and secondary stakeholders in order to guide implementation of these prescriptions. In addition, duration reflects the time frame which is required to complete the activity. The duration of the activity is defined as Short-term (< 2 years), Medium-term (2-5 years) and Long-term (> 5 years).

The time frame for this management plan is 10 years. It is intended that all prescriptions will be implemented during this time frame, which will maintain and improve the integrity of the Protected Area as described in the definition of a Game Reserve. Some recommendations are already being implemented under the WWF-Pakistan's Pakistan Wetlands Programme, and a few other initiatives by the government line agencies and a few other prescriptions will be implemented in collaboration with partners. The priority assigned to each intervention can be further used for guidance in the implementation.

Funding to implement prescriptions of this management plan can be sought from a range of potential donors through developing proposals, co-financing, in kind contributions from existing programmes and building partnerships with other government line agencies.

9.2. Species Specific Management Plans

In addition, species specific management plans (globally significant species of Punjab Urial and White-headed Duck) are also described in the form of a matrix, which describes the species and related issues, possible set of prescriptions, means of verifications, responsibilities and the time frame. The species discussed in the individual species management plans describes their entire distribution and habitat range in the Salt Range Wetlands Complex (Kallar Kahar Game Reserve is a part of Salt Range Wetlands Complex). In addition, there are other species of special concern present in the Salt Range which will be discussed in the management plans of individual sites.

Table 4: List of Priority Prescriptions for Implementation of Kallar Kahar Game Reserve Management Plan

#	Prescriptions / Interventions	Priority	Responsibility		Duration
			Primary	Secondary	
1.	Management Interventions				
1.1.	Improving Stakeholder Coordination at the Provincial Level				
1.1.1.	<i>Establish Provincial Wetlands Management Committee under the Chairmanship of Secretary Forestry, Wildlife and Fisheries, Government of Punjab with representatives of other relevant Departments to guide and institutionalising wetlands conservation in the Province.</i>	High	WWF-Pakistan	Punjab Forestry, Wildlife and Fisheries Department	Immediate
1.2.	Improving Stakeholder Coordination at the Site Level				
1.2.1.	<i>Establish Site Specific Wetlands Management Committee under the Chairmanship of respective Deputy Director, Wildlife (Punjab Wildlife and Parks Department)/District Coordination Officer (DCO) with local representatives of other line Departments to help implement specific wetlands interventions at the site level.</i>	High	WWF-Pakistan	Punjab Forestry, Wildlife and Fisheries Department / District Coordination Officer, Chakwal	Immediate
1.3.	Improving law enforcement in the area				
1.3.1.	<i>Establish at least two check posts in the area to stop poachers and illegal hunting</i>	Medium	Punjab Wildlife and Parks Department	City District Government, Chakwal	Short-term
1.3.2.	<i>Provide additional support to Kallar Kahar Game Reserve through deputing at least two community wildlife watchers in coordination with Site Level Wetlands Management Committee, to promote collaborative management</i>	Medium	Punjab Wildlife and Parks Department	City District Government, Chakwal	Short-term
1.3.3.	<i>Sign Terms of Partnerships with local communities to reduce harmful practices (pollution, illegal hunting and vegetation cutting etc.)</i>	High	WWF-Pakistan	City District Government, Chakwal	Medium Term
1.4.	Strengthening knowledge and technical capacity of the field staff of Punjab Wildlife and Parks Department				
1.4.1.	<i>Train field Wildlife Watchers in "wildlife identification techniques, survey techniques, data recording and compilation, use of binoculars and spotting scope, first aid, wireless communication and effective watch and ward"</i>	High	WWF-Pakistan	Punjab Wildlife and Parks Department	Short-term
1.4.2.	<i>Equip the staff of the Punjab Wildlife and Parks Department with wireless handsets, transport facilities and security weapons for staff posted at check posts.</i>	Medium	Punjab Wildlife and Parks Department	WWF-Pakistan	Medium Term
2.	Ecological Interventions				
2.1.	Promoting conservation and sustainable use of Natural Resources of Kallar Kahar Game Reserve and its environs				
2.1.1.	<i>Conduct regular population surveys of large mammals especially Punjab Urial at known locations in the catchment area of the Protected Area.</i>	High	WWF-Pakistan	Punjab Wildlife and Parks Department	Long-term
2.1.2.	<i>Sign partnership agreements with local communities (CBOs) to help protect large mammals (e.g. Punjab Urial) in their immediate vicinity.</i>	High	WWF-Pakistan	Punjab Wildlife and Parks Department	Short-term
2.1.3.	<i>Explore the possibility of hiring two community wildlife watchers for effective watch and ward of Punjab Urial at known locations in the region</i>	Medium	Punjab Wildlife and Parks Department	WWF-Pakistan	Long-term
2.1.4.	<i>Conduct joint surveys (WWF-Pakistan, Local Communities, Punjab Wildlife and Parks Department) to confirm the presence of Chinkara in the catchment areas of the lake</i>	Medium	Punjab Wildlife and Parks Department	WWF-Pakistan, City District Government	Short-term

#	Prescriptions / Interventions	Priority	Responsibility		Duration
			Primary	Secondary	
2.2.	Promoting sustainable waterfowl hunting in Kallar Kahar Game Reserve				
2.2.1.	<i>Initiate an awareness raising campaign (poster, brochures, information boards etc.) in the area to reduce illegal waterfowl hunting, especially during migratory season</i>	High	WWF-Pakistan	Punjab Wildlife and Parks Department, CHAP	Long-term
2.2.2.	<i>Organise a Waterfowl Sport Hunters Meet in collaboration with "Punjab Wildlife and Parks Department" and "Conservation and Hunting Association of Pakistan" to promote sustainable hunting with established hunting code of ethics for hunters.</i>	High	WWF-Pakistan	Punjab Wildlife and Parks Department, CHAP	Short-term
2.2.3.	<i>Initiate and finalise dialogues with the "Conservation and Hunting Association of Pakistan" for notification of their "Punjab Chapter" to monitor waterfowl hunting in the province in general and Kallar Kahar in particular</i>	High	WWF-Pakistan	CHAP, Punjab Wildlife and Parks Department	Short-term
2.3.	Raising awareness to reduce retaliatory killing				
2.3.1.	<i>Highlight the role of local biodiversity in controlling pests, soil fertility, agriculture by developing, displaying and disseminating information through information boards, brochures, flyers and other campaigns</i>	Medium	WWF-Pakistan	Punjab Wildlife and Parks Department	Medium Term
2.4.	Conserving catchment area of the Kallar Kahar Lake				
2.4.1.	<i>Initiate dialogues with District Coordination Officer (City District Government) to stop new developmental schemes in the catchment area of Kallar Kahar Game Reserve</i>	High	WWF-Pakistan	Punjab Wildlife and Parks Department, Punjab Tourism and Resort Development Department	Medium Term
2.4.2.	<i>Develop and present a proper land use plan (defining development area and natural vegetation) with the help of a GIS tool to the City District Government for its approval and implementation, in order to maintain the ecological integrity of the Kallar Kahar Game Reserve</i>	High	WWF-Pakistan	Punjab Wildlife and Parks Department, Punjab Forest Department, Punjab Tourism and Resort Development Department	Short-term
2.4.3.	<i>Conduct Environmental Impact Assessment of all new developmental schemes / construction work planned in the catchment area of the Kallar Kahar Game Reserve</i>	Medium	Punjab EPA	WWF-Pakistan	Medium Term
2.4.4.	<i>Initiate dialogues with local livestock herders and sign Terms of Partnerships with the local stakeholders to promote rotational grazing system in the catchment area for effective growth of natural vegetation.</i>	High	WWF-Pakistan	Punjab Forest Department	Short-term
2.4.5.	<i>Explore alternate fodder options for domestic livestock in collaboration with local communities (VWCCs)</i>	Medium	WWF-Pakistan	Other local Partners	Long-term
2.4.6.	<i>Collaborate with City District Government and Punjab Forest Department to initiate plantation campaign of local flora in the catchment area of the Kallar Kahar Game Reserve, preferably at open patches</i>	Medium	Punjab Forest Department	WWF-Pakistan, City District Government	Long-term
2.4.7.	<i>Conduct dialogues with local farmers to plant multi-purpose fast growing tree species at their farmlands to meet their domestic fuelwood needs</i>	Medium	Punjab Forest Department	WWF-Pakistan	Long term
2.4.8.	<i>Explore feasible, acceptable and easily installable alternate energy options to reduce pressure on natural forests of the catchment area of the Game Reserve. This may include the provision of Biogas plants, fuel-efficient stoves, energy plantation, solar geysers and solar cookers.</i>	High	WWF-Pakistan	PDDC, PCRET, local partners	Long-term
2.4.9.	<i>Negotiate community share of at least 20% of the total cost of the unit of any feasible option.</i>	High	WWF-Pakistan	VWCCs	Short-term

#	Prescriptions / Interventions	Priority	Responsibility		Duration
			Primary	Secondary	
2.4.10.	<i>Develop partnerships and linkages with Punjab Dairy Development Council (PDDC), Pakistan Council for Renewable Energy Technology (PCRET) for installation of these alternate energy options on a cost sharing basis</i>	High	WWF-Pakistan	PDDC, PCRET, VWCCs	Medium Term
2.4.11.	<i>Initiate a research study to determine the impacts of such alternate energy options on the existing fuelwood use by local communities.</i>	High	WWF-Pakistan	Academia	Medium term
2.4.12.	<i>Sign conservation agreements with the local communities to monitor fuelwood extraction from the adjoining areas of the Game Reserve.</i>	High	WWF-Pakistan	VWCCs	Medium term
2.4.13.	<i>Develop a mechanism of effective watch and ward in collaboration with existing VWCCs to monitor fuelwood extraction from the catchment area of the Game Reserve which is the main habitat of Punjab Uril</i>	High	WWF-Pakistan	Punjab Wildlife and Parks Department	Medium term
2.4.14.	<i>Liase with livestock herders / grazers to stop intentional forest fires in order to protect habitat for endemic Punjab Uril and other large mammals found in the area.</i>	High	WWF-Pakistan	Punjab Forest Department	Short-term
2.4.15.	<i>Provide training to Community Activists and Wildlife Watchers to stop forest fire</i>	High	WWF-Pakistan	Punjab Wildlife and Parks Department	Medium term
2.5.	Improving and disseminating the knowledge base of existing natural resources of the lake and its environs.				
2.5.1.	<i>Conduct population surveys of Large Mammals (Punjab Uril and others) in the vicinity of Kallar Kahar Game Reserve during rut and lambing seasons</i>	High	WWF-Pakistan	Punjab Wildlife and Parks Department, VWCCs	Short-term
2.5.2.	<i>Conduct migratory bird survey season preferably during the peak season in January each year to determine the population trends over years.</i>	High	WWF-Pakistan	Punjab Wildlife and Parks Department	Short-term
2.5.3.	<i>Initiate dialogues with selected Academia and sign MoU to monitor the changes on a regular basis in natural vegetation (terrestrial and aquatic), water quality and fish abundance and diversity, as part of their research work</i>	Medium	WWF-Pakistan	Academia	Medium Term
2.5.4.	<i>Provide updated biophysical and ecological information to national and international databases for promotion of the resources of the Kallar Kahar Game Reserve</i>	Medium	WWF-Pakistan	ZSD, NCCW, MoE	Short-term
2.5.5.	<i>Install at least five Information Boards, displaying information about the status of the Protected Area and its resources, core and buffer area and the do's and don'ts in collaboration with City District Government and Punjab Wildlife and Parks Department.</i>	High	WWF-Pakistan	City District Government, Punjab Wildlife and Parks Department	Short-term
2.5.6.	<i>Establish a "Bird Hide" in collaboration with Punjab Tourism and Resort Development Department and City District Government to promote and appreciate the biodiversity of the region to the local, national and international visitors.</i>	High	WWF-Pakistan	Punjab Tourism and Resort Development Department, City District Government	Short-term
2.5.7.	<i>Develop a mechanism of generating revenue from the eco-tourism ventures to maintain and improve conservation initiatives and financially support local communities for their active involvement in wetlands conservation in particular and natural resources of the area in general</i>	High	WWF-Pakistan	Punjab Tourism and Resort Development Department, City District Government	Long-term
2.5.8	<i>Explore the opportunities of other eco-tourism ventures (e.g. community guest houses, camping places, traditional foods, historic importance of the site etc.) in collaboration with Tourism related agencies (STFP, TDCP etc.)</i>	High	WWF-Pakistan	Punjab Tourism and Resort Development Department, City District Government	Long-term
2.5.9.	<i>Develop partnership agreements with tourism related agencies to promote the Kallar Kahar eco-tourism potential and help arrange eco-tours to the area on a regular basis.</i>	High	WWF-Pakistan	Punjab Tourism and Resort Development Department, STFP	Medium Term

#	Prescriptions / Interventions	Priority	Responsibility		Duration
			Primary	Secondary	
2.5.10.	<i>Initiate dialogues with City District Government and Punjab Tourism and Resort Development Department to develop Kallar Kahar Conservation and Information Centre in order to disseminate information about the natural resources of the area and its surroundings.</i>	Medium	<i>Punjab Wildlife and Parks Department</i>	<i>Punjab Tourism and Resort Development Department, City District Government</i>	Long-term
2.5.11.	<i>Initiate a well targeted school awareness campaign in the region through the establishment of nature clubs and promote their involvement in site level activities related to solid waste management, plantation, beach cleaning, celebrating significant environmental days, walks, presentation to schools, training of trainers, etc</i>	High	<i>WWF-Pakistan</i>	<i>Punjab Tourism and Resort Development Department, City District Government</i>	Long-term
2.5.12.	<i>Develop and disseminate awareness material related to the site and seek the active involvement of the local stakeholders.</i>	Medium	<i>WWF-Pakistan</i>	<i>Punjab Tourism and Resort Development Department, City District Government</i>	Medium Term
2.6.	Zonation of the Kallar Kahar Lake				
2.6.1.	<i>Assess the field information with regards to the use of Kallar Kahar Lake as a recreation site and habitat for resident and migratory birds</i>	High	<i>WWF-Pakistan</i>	<i>Punjab Tourism and Resort Development Department, City District Government</i>	Short-term
2.6.2.	<i>Develop a GIS based zonation of the lake clearly demarcating areas of recreation (buffer zone) and habitat for resident and migratory birds (core zone)</i>	High	<i>WWF-Pakistan</i>	<i>Punjab Tourism and Resort Development Department, City District Government</i>	Short-term
2.6.3.	<i>Present the assessment to the City District Government and Tourism and Resort Development Department for comments, approval and its effective implementation.</i>	High	<i>WWF-Pakistan</i>	<i>Punjab Tourism and Resort Development Department, City District Government</i>	Medium Term
2.7.	Promoting indigenous <i>flora</i> and <i>fauna</i> in and outside the Protected Area				
2.7.1.	<i>Discuss the issue of exotic species of fish in the lake and Eucalyptus in the buffer zone, as one of the agenda items in the Provincial as well as Site Level Wetlands Management Committees, in order to maintain and improve the ecology and integrity of the Protected Area.</i>	High	<i>WWF-Pakistan</i>	<i>Punjab Forestry, Wildlife and Fisheries Department</i>	Medium Term
2.7.2.	<i>Supplement the existing fish stock in the lake with local species in order to phase out exotic species and to reduce their impacts on the aquatic flora and fauna</i>	Medium	<i>Punjab Fisheries Department</i>	<i>City District Government, WWF-Pakistan</i>	Long-term
2.7.3.	<i>Collaborate with City District Government, Chakwal and Punjab Forest Department in coordination with local partners to plant indigenous tree species in the open patches in catchment areas to reduce the expansion of invasive species (e.g. <i>Dodonea viscosa</i>), which is an indicator species of degraded and over-grazed area.</i>	Medium	<i>Punjab Forest Department, City District Government</i>	<i>WWF-Pakistan</i>	Long-term
2.7.4.	<i>Initiate dialogues with local landowners in the catchment area to declare "Communal Protected Areas" to conserve the local vegetation of the region.</i>	Medium	<i>WWF-Pakistan</i>	<i>Punjab Forest Department, VWCCs</i>	Long-term
2.7.5.	<i>Establish at least two exclosures in the vicinity of Kallar Kahar Lake to demonstrate the growth of indigenous vegetation to the local communities and partners.</i>	High	<i>WWF-Pakistan</i>	<i>Punjab Forest Department, VWCCs</i>	Short-term

#	Prescriptions / Interventions	Priority	Responsibility		Duration
			Primary	Secondary	
3.	Socio-economic Interventions				
3.1.	Involving local stakeholders in collaborative management of the natural resources of the area				
3.1.1.	<i>Organise local wetland dependent communities surrounding the Kallar Kahar Game Reserve, as Village Wetlands Conservation Committees (VWCCs) through nominations of the Office Bearers and development of Terms of References of the Committee.</i>	High	WWF-Pakistan	National Rural Support Programme (NRSP)	Long-term
3.1.2.	<i>Sign Terms of Partnerships with organised communities for implementation of wetlands management interventions</i>	High	WWF-Pakistan	NRSP, VWCCs	Short-term
3.1.3.	<i>Register VWCCs as CCBs (Community Citizen Boards) with local Social Welfare Department as qualifying criteria to get financial support from City District Government for socio-economic interventions of their area.</i>	High	WWF-Pakistan	Social Welfare Department, Chakwal	Short-term
3.1.4.	<i>Provide training to VWCCs and CCBs in record keeping, account maintenance, office maintenance, data recording, developing proposals, effective watch and ward, ownership of resources and interventions.</i>	High	NRSP	WWF-Pakistan, Social Welfare Department	Medium Term
3.1.5.	<i>Develop a social maturity index for the organised communities in order to ensure their sustainability</i>	Medium	WWF-Pakistan	NRSP, VWCCs	Medium Term
3.2.	Alleviating poverty and improving alternative livelihood opportunities				
3.2.1.	<i>Initiate a study to develop and implement alternate livelihood action plan in collaboration with wetland dependent communities living on the edges of the lake.</i>	Medium	WWF-Pakistan	VWCCs	Medium Term
3.2.2.	<i>Provide training to local communities in skill development and enhancement to improve their alternate livelihood e.g. eco-tourism, kitchen gardening, poultry farming, apiculture, adopting best management practices, livestock management through vaccination and de-worming, Vocational training centres, marketing natural resource based products, etc.</i>	High	WWF-Pakistan, NRSP	Social Welfare Department	Medium Term
3.2.3.	<i>Promote eco-tourism in the area through signing Memorandum of Understanding (MoU) with Punjab Tourism and Resort Development Department and Sustainable Tourism Foundation of Pakistan.</i>	High	WWF-Pakistan	Punjab Tourism and Resort Development Department	Short-term
3.2.4.	<i>Provide training to local community activists as guides and support staff in enhancing opportunities of eco-tourism through community collaboration</i>	High	WWF-Pakistan	Adventure Foundation of Pakistan, STFP	Medium Term
3.2.5.	<i>Promote the richness of the area to attract tourists from adjoining areas and enhance the local income</i>	High	WWF-Pakistan	Punjab Tourism and Resort Development Department, STFP	Medium Term
3.2.6.	<i>Enhance partnerships and linkages with other programmes operational in the area for supporting local livelihoods</i>	Medium	WWF-Pakistan	VWCCs	Long-term
3.2.7.	<i>Initiate livestock vaccination and de-worming coupled with awareness campaign in order to avoid disease transmission especially from domestic to wild ungulates</i>	High	WWF-Pakistan	Punjab Livestock Department	Medium Term
3.2.8.	<i>Develop funding proposals for national and international donors to specifically address the issues of poverty-environment nexus</i>	High	WWF-Pakistan	VWCCs	Short-term
3.2.9.	<i>Develop a mechanism to hire local community activists for various ecological and social interventions for their direct financial benefit and build confidence and trust in order to seek their support,</i>	Medium	WWF-Pakistan	VWCCs	Short-term

#	Prescriptions / Interventions	Priority	Responsibility		Duration
			Primary	Secondary	
3.3.	Promoting sustainable extraction of NTFPs and value addition of community-based products				
3.3.1.	<i>Initiate a baseline need assessment to know the status and kind of communities involved in NTFPs for earning their livelihood from natural resources.</i>	Medium	WWF-Pakistan	Punjab Forest and Wildlife Department	Short-term
3.3.2.	<i>Generate comprehensive information on the list of natural resource based products, species used, area from where the NTFPs are collected, quantity of NTFPs collected, income generation from these products in order to appreciate the role of wetlands in livelihood generation, quality of products etc.</i>	Medium	WWF-Pakistan	Punjab Forest and Wildlife Department, VWCCS	Short-term
3.3.3.	<i>Undertake a supply chain analysis of natural resource based products in order to reduce collection of Typha, Phragmites and Saccharum sp and to identify potential areas for value addition to this activity. This could be tied to agreements on reducing extraction levels inside the Kallar Kahar Game Reserve.</i>	Medium	WWF-Pakistan	Punjab Forest Department	Short-term
3.3.4.	<i>Reduce the role of middlemen in order to fetch better economic opportunities for the local communities involved in developing natural resource based products.</i>	Medium	WWF-Pakistan	Local Partners, VWCCS	Medium Term
3.3.5.	<i>Initiate a range of activities at sites including development of Community Resource Centres, Conservation and Information Centres, displaying products at exhibitions and nature carnivals, Vocational Training Centres, etc.</i>	Medium	WWF-Pakistan	Punjab Tourism and Resort Development Department	Long-term
3.3.6.	<i>Study the products already being sold in the markets to guide local communities for value addition of their products.</i>	Medium	WWF-Pakistan	Other local partners	Short-term
3.3.7.	<i>Introduce commercial players in the market especially at Rawalpindi / Islamabad, Lahore, Chakwal, Jhelum and other adjoining cities so that communities can negotiate directly for their products and prices.</i>	High	WWF-Pakistan	VWCCS	Medium Term
3.4.	Non biodegradable pollution originating from a broad range of human activities.				
3.4.1.	<i>Undertake preliminary research study at selected points within the Protected Area to determine levels of pollution of all kinds.</i>	High	WWF-Pakistan	Academia	Short-term
3.4.2.	<i>Develop a Protected Area Pollution Management Plan in collaboration with WWF-Pakistan's Freshwater and Toxics Programme and Environmental Protection Agency</i>	High	WWF-Pakistan	EPA, Punjab	Medium Term
3.4.3.	<i>Explore other local and feasible options e.g. installing effluent treatment plants, constructed wetlands, initiating awareness raising campaigns for farmers, farmyard manure, compost and treated seeds, to reduce the use of harmful pesticides for orchard development and to avoid eutrophication of the lake</i>	Medium	EPA, Punjab	WWF-Pakistan	Long-term
3.4.4.	<i>Build partnerships and linkages with other national stakeholders to develop the capacity of the EPA in effectively controlling pollution entering into the Protected Area</i>	Medium	WWF-Pakistan	EPA	Medium Term
3.5.	Encroachment in and around the Protected Area				
3.5.1.	<i>Establish a baseline assessment of status of land encroachment in and outside the Game Reserve for various purposes through GIS-based approach.</i>	Medium	WWF-Pakistan GIS Lab	Punjab Forest and Wildlife Department	Medium Term
3.5.2.	<i>Determine the baseline assessment of wildlife of the region, which is being affected from illegal encroachment and habitat destruction as a result.</i>	Medium	WWF-Pakistan	Punjab Wildlife and Parks Department	Medium Term

#	Prescriptions / Interventions	Priority	Responsibility		Duration
			Primary	Secondary	
3.5.3.	<i>Develop a consensus amongst the stakeholders to share information with relevant government authorities for necessary action in order to protect the ecological integrity of the Protected Area.</i>	<i>Medium</i>	<i>WWF-Pakistan</i>	<i>Other Government Line Agencies</i>	<i>Short-term</i>
3.6.	Improving water flow to the lake				
3.6.1.	<i>Initiate dialogues with farmland owners growing orchards in the vicinity of Kallar Kahar Game Reserve to release water for lake originating from the nearby springs</i>	<i>High</i>	<i>WWF-Pakistan</i>	<i>City District Government</i>	<i>Medium Term</i>
3.6.2.	<i>Explore the possibility of conserving water through installation of drip irrigation systems. This would initially be at small scale for demonstration purposes for subsequent adoption by farmers on a shared basis.</i>	<i>Medium</i>	<i>WWF-Pakistan</i>	<i>City District Government</i>	<i>Medium Term</i>

This page has been left blank intentionally

Species Specific Management Plans for Salt Range Wetlands Complex

A. Punjab Urrial – *Ovis vignei punjabiensis*

#	Threat	Possible set of prescriptions	Means of Verifications	Lead Agency	Other partners	Timeline
Punjab Urrial	1.1. Inadequate information about the habitat requirements by Punjab Urrial	1.1.1. Commission a research programme (e.g. Academia and research institutions and individuals researchers)	Small scale research project proposals on Punjab Urrial	PWP/WWF-P	ZSD, PMNH, PW&PD, WWF-P, Researchers, Academia, Research Institutions, Communities	2011-2012
			Letter of Agreements with research Academia, institutions and researcher	PWP/WWF-P		2011-2012
	1.2. Inadequate sharing of information regarding wildlife species in general and Punjab Urrial in particular	1.2.1. Ensure that all the credible reports are available on web portals 1.2.2. Encourage publications in peer – reviewed journals and provide incentives such as cash awards, certificates etc. 1.2.3. Help establish Data repository (NCCW-MoE GIS database)	Reports available on the web portals	PWP/WWF-P	ZSD, PMNH, PW&PD, WWF-P, Researchers, Academia, Research Institutions	2011-2012
			Annual events	PWP/WWF-P		2012-2013
			Photographs	PWP/WWF-P		2012-2013
	1.3. No standardised survey methods applied for surveying of wild herbivores	1.3.1. Develop a standard manual on surveying techniques of wild animals	Database available at MoE's GIS database	PWP/WWF-P	ZSD, PW&PD	2012-2013
			Training Manual available	PWP/WWF-P		2011-2012
	1.4. Illegal hunting and poaching	1.4.1. Enhance law enforcement efforts 1.4.2. Build capacity of the Provincial Wildlife Department 1.4.3. Encourage community-based trophy hunting based on annual population monitoring 1.4.4. Species specific awareness efforts	Record of Challans	PW&PD/PWP	WWF-P, ZSD, PMNH, Academia, Communities, Researchers, Individual hunters	Ongoing
			Training reports	PW&PD/PWP		Ongoing
			Number of people involved	PW&PD/PWP		Ongoing
			Annual population reports	PW&PD/PWP		Ongoing
			Number of community watchers involved in protection efforts	PW&PD/PWP		Ongoing
	Published awareness material	PW&PD/PWP	2011 onwards			
	1.5. Habitat fragmentation and degradation	1.5.1. Detailed habitat mapping using GIS-based information 1.5.2. Define and establish land tenure system, where possible in order to reduce competition with domestic livestock, and habitat fragmentation 1.5.3. Establish corridors to avoid inbreeding in fragmented populations	GIS-based habitat maps	PW&PD/PWP	WWF-P/BOR	2012-2013
			Notifications and revenue records	PW&PD/PWP	WWF-P/BOR, Local conservation partners	2012
			GIS based locations for corridors marking preferred habitat by Urrials	PW&PD/PWP	WWF-P/BOR	2012-2015
Letter of Agreement with the stakeholder for corridors			PW&PD/PWP	WWF-P/BOR	2013	
1.6. Uncertain taxonomic status of Punjab Urrial	1.6.1. Conduct genetic analysis studies involving academia and institutions	Reports available	Academia/ Research Institutions	PWP/WWF-P, PW&PD, Individual Researchers	2011-2013	

B. White-headed Duck – *Oxyura leucocephala*

#	Threat	Possible set of prescriptions	Means of Verifications	Lead Agency	Other partners	Timeline	
White-headed Duck	1.1. Inadequate information about the habitat requirements by White-headed Duck	1.1.1. Commission a research programme (e.g. Academia and research institutions and individuals researchers)	Small scale research project proposals on White-headed Duck	PWP/WWF-P	ZSD, PMNH, PW&PD, WWF-P, Researchers, Academia, Research Institutions, Communities	2012 onwards	
			Letter of Agreements with research Academia, institutions and researcher	PWP/WWF-P		2011	
	1.2. Inadequate sharing of information regarding wildlife species in general and White-headed Duck in particular	1.2.1. Ensure that all the credible reports are available on web portals	1.2.1. Ensure that all the credible reports are available on web portals	Reports available on the web portals	PWP/WWF-P	ZSD, PMNH, PW&PD, WWF-P, Researchers, Academia, Research Institutions	2011-2012
			1.2.2. Encourage publications in peer – reviewed journals and provide incentives such as cash awards, certificates etc.	Annual events	PWP/WWF-P		2011-2015
				Photographs	PWP/WWF-P		2011-2015
			1.2.3. Help establish Data repository (NCCW-MoE GIS database)	Database available at MoE's GIS database	PWP/WWF-P		2012 onwards
	1.3. Lack of awareness regarding the species	1.3.1. Initiate a well targeted species awareness campaign	Poster and flyer	PWP/WWF-P	ZSD, PW&PD	2011-2015	
	1.4. Illegal hunting causing disturbance to species staging grounds	1.4.1. Enhance law enforcement efforts	Record of Challans	PW&PD/PWP	WWF-P, ZSD, PMNH, Academia, Communities, Researchers, Individual hunters	2011 onwards	
			Training reports	PW&PD/PWP		2011 onwards	
		1.4.2. Build capacity of the Provincial Wildlife Department	Number of people involved	PW&PD/PWP		2011 onwards	
			1.4.3. Encourage community-based conservation and monitoring programme especially during migratory season	Annual population trends / reports		PW&PD/PWP	2011 onwards
		Number of community watchers involved in protection efforts	PW&PD/PWP	2011 onwards			
	1.5. Habitat degradation due to diversion, aquatic vegetation cutting and pollution originating from a broad range of human activities	1.5.1. Detailed habitat mapping using GIS-based information indicating habitat threats	GIS-based habitat maps	PW&PD/PWP	WWF-P	2011-2012	
		1.5.2. Define measures to improve habitat conditions e.g. protection against illegal vegetation cutting, developing constructed wetlands in the vicinity of lake to reduce pollution, community consultations to stop encroachment, using efficient irrigation system in the buffer zone agricultural areas etc.	Terms of Partnerships with communities	PW&PD/PWP	WWF-P/, Local conservation partners	2011-2012	