المركز الوطني
لتنمية الحياة الفطرية
National Center for Wildlife
المملكة العربية السعودية

Raydah Protected Area Management Plan

2024-2030

EXECUTIVE SUMMARY

Raydah Protected Area (RPA) envisions becoming a restored, protected, resilient, and sustainably used example of the ecological processes, habitats, and species typical of Asir Escarpment Slope and Asir Escarpment Crest Juniper Woodland Ecosystems, which supports sustainable benefits to local and visiting communities. To achieve this vision, the site must be managed effectively; in that regard, developing this General Management Plan (GMP) is critical. The development of this SMP is linked to Article 32 of the Constitution of the Kingdom of Saudi Arabia (KSA) which states that "*the State shall endeavor to preserve, protect and improve the environment and prevent its pollution*" and Article 3 of the Wildlife Protected Areas Law that empowers the National Center of Wildlife （NCW) to Manage Protected Areas (PAs) in the Kingdom of Saudi Arabia. Therefore, this plan is set to guide the implementation of daily operations of the protected area from 2024 to 2030 in a manner that will contribute to the achievement of the PA's Vision, fulfillment of the constitutional obligations, and meet international standards and best practices.

The GMP is structured into six sections with several subsections. In Section One, the GMP presents the biogeography of the KSA, its Social and Political Contexts, and the History of PAs in the KSA. Besides, the Section introduces ten PAs that NCW administratively manages. Additionally, the Section unveils the main objectives of the Management Plan and provides an overview of various studies conducted in the PA. Section Two of the SMP describes the legal status and policy framework. Specifically, the section presents the current and future policy framework (institutional and general legal settings, PA establishment history, recent conservation developments, PA policy environment, and international agreements). Under the general legal setting, the GMP enlists regulations, national laws, guidelines, and regional and Global strategies or conventions that support conservation and the management of the PA, and GMP-specific frameworks covering ecosystem restoration frameworks, and adaptive management.

Section Three presents detailed information about the PA Assessment. The section starts with a comprehensive introduction of the RPA, its context and accessibility, management resources and infrastructure, and analyses of the physical (topography, geology and soils, hydrology and climate) and biological environments (ecosystem characterization, plants, problem plants, animals, rare and threatened species). Additionally, the section presents tourism assets, activities and use, socio-cultural and heritage assets, stakeholder analysis, current threats and pressures, and synopses of the Situational and SWOT analyses. Section Four mainly covers vision and target outcomes. Specifically, in this section, one will find stakeholders' consultation outcomes, major site values, and the PA's Vision, Mission, and Goals in tandem with strategic objectives and operational KPIs. Section Five provides the Strategy and Road Map in four subsections that include threat mitigation and restoration initiatives, zoning and phasing strategy, operations, infrastructure, and other interventions while section Six describes enablers and implementation plans under four subsections representing operational design focusing on governance structure, organization, people and rationale; risk mitigation approach, implementation strategy (covering ten management and conservation-related interventions/programs/issues) and monitoring approach. The GMP also constitutes references and lists of figures, tables, and maps.

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ABBREVIATIONS/ ACRONYMS

GMP	General Management Plan
IUCN	International Union for Conservation of Nature
IFBTRR	Imam Faisal bin Turki Royal Reserve
RPA	Raydah Protected Area
KSA	Kingdom of Saudi Arabia
MEWA	Ministry of Environment, Water, and Agriculture
MoT	The Ministry of Tourism
NBSAP	National Biodiversity Strategy and Action Plan
NCW	National Center for Wildlife
NCWCD	National Center for Wildlife Conservation and Development
NCWM	National Center for Waste Management
PA	Protected Area
SASO	Saudi Standards, Metrology, and Quality Organization
SENS	Saudi Environmental Society
SGI	Saudi Green initiative
TFA	Tourism Focus Area
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
VAC	Visual Absorption Capacity

GLOSSARY OF TERMS

TERM	DEFINITION
Alien invasive species	A non-native plant or animal species that, when introduced to a new habitat, can spread if uncontrolled, causing harm to the native species, environment, economy, or human health.
Biodiversity	Biodiversity is biological diversity - the full variety of living things – including plants, animals, fungi, and bacteria. It is considered at all scales, from the different genes in an individual to species and the populations they form, as well as the complex arrangements of ecosystems.
Biogeography	The distribution patterns of ecosystems and biodiversity across space and time and their geographic ranges.
Ecoregions	Distinct geographic areas characterized by specific combinations of climate, vegetation, and ecological features, serve as ecological units that help in understanding and managing biodiversity patterns.
Carrying capacity (Tourism)	The number of animals or visitors, intensity, and type of use that can be accommodated in an area without deterioration of the essential biophysical, conservation, and experiential values of a particular environment.
Cultural heritage	Inherited assets that people identify and value as a reflection and expression of their evolving knowledge, beliefs, and traditions, and of their understanding of the beliefs and traditions of others.
Endangered species	Species that are at significant risk of becoming extinct soon if effective conservation measures are not taken.
Impact	An impact upon visual aspects of the heritage or natural setting, a direct impact upon the physical environment, or an impact on the biological components or properties of an ecosystem.
IUCN Green List	The IUCN Green List is a global program of certification aiming to achieve and promote effective, equitable, and successful protected and conserved areas by highlighting best practices and providing a benchmark for progress toward effective and equitable management.
IUCN Red List	The International Union for Conservation of Nature's list of species is categorized by their risk of extinction.
Integrity	A measure of the wholeness and intactness of a Protected Area and the survival and condition of those elements that contribute to their significance.
KPI	Key Performance Indicators (KPIs) are the critical (key) quantifiable indicators of progress toward an intended result.
Monitoring and Evaluation	The systematic collection and analysis of data to assess the performance and effectiveness of management actions.
Poaching	Illegal hunting, capturing, or harvesting of wildlife, often for trade or consumption.
Protected Area	A protected area is a clearly defined geographical space, recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.
Restoration	To return a conservation asset to a known earlier state in terms of diversity, abundance, and/or ecological functioning.
Stakeholder engagement	The process of involving individuals, groups, and organizations who have an interest or stake in the management of a protected area.
Sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Zoning	The process of delineation of a protected area into different zones, each with specific regulations and permitted activities.

SECTION ONE: INTRODUCTION

1.1. BIOGEOGRAPHY OF SAUDI ARABIA

The Kingdom of Saudi Arabia is about 2,000,000 $km^{2,}$ occupying four-fifths of the Arabian Peninsula. It is the tenth largest country, covering 1.64% of the world's land area and 8% of the land area of Asia.

Saudi Arabia divides naturally into seven terrestrial physiographic regions (with 30 subregions) and two marine regions (Child & Grainger, 1990). More recently, a new classification defines hierarchically a total of 4 Realms, 20 Eco-regions, and 65 Ecosystems (Llewellyn, 2013). These ecosystems span a wide diversity of terrestrial habitats, from mesic, cool, high mountains through arid desert steppes to hot, semi-arid coastal plains. The range of marine habitats is diverse and includes mangroves, sea grass beds, and coral reefs of both the Western Indo-Pacific (Red Sea) and Indo-Malayan (Arabian Gulf) realms.

Despite this large area, the flora, of about 2,250 species, is comparatively modest in number of species, but it is biogeographically very interesting in containing elements of three major elements, namely the western part of the Palearctic, the Afrotropical, and the Oriental. Hence the region has a flora that includes representatives of European, Asian, and African groups (García, *et al.* 2015). Although well-known at a broad taxonomic level, details of the distribution and population status of many species are still poorly documented. Increasing human pressures leading to habitat loss, chronic overgrazing, cutting of trees for firewood, and indiscriminate off-roading on fragile desert soils, exacerbate the impact of severe droughts and low and unpredictable rainfall even under normal conditions.

The diversity of large animals and birds is also modest. Species, such as Arabian oryx, Nubian ibex, Dugong, and Arabian leopard, for example, are restricted in distribution whereas many migratory birds cross the Arabian Peninsula as part of a major migratory flyway. Many of the larger mammals were either extirpated (Arabian oryx) or exist as fragmented, small populations (Nubian ibex, Mountain gazelle). The invertebrate fauna is poorly known, and new species are regularly documented. Most elements of the fauna are under threat from changes in land use practices that alter habitats (especially mountains, wetlands, and coastal areas) as well as through unsustainable hunting practices.

1.2. SOCIAL AND POLITICAL CONTEXT

The social and political context of each country shapes how biodiversity conservation and management is undertaken. The economic status of the country, the standard of infrastructural development, the size, income, and educational levels of its population, and its beliefs and customs lead to unique and applicable approaches to the management of its protected areas.

The Kingdom of Saudi Arabia is a vast country with ample human and financial capital as well as large energy and mineral resources. The younger generation makes up over two-thirds of Saudi Arabia's population of 35 million. Saudi Arabia is an absolute monarchy, Traditional family and Islamic values remain central. Saudi Arabia is culturally a tribal society. Most people are deeply religious and conservative.

Part 2 of the National Biodiversity Strategy for the Kingdom of Saudi Arabia looks at the Islamic vision and basic principles guiding the conservation of biodiversity and stresses the fact that the conservation of the natural environment is an imperative commanded by Allah. The protection of the natural environment from abuse by man leads to the welfare of man himself, together with the welfare of all other beings.

Vision 2030 outlines transformational economic and social development changes for the Kingdom. It has many strands of which the focus on sustainability, clean energy, and the development of tourism has an important bearing on the future management and development of the Protected Areas of the Kingdom.

1.3. HISTORY OF PROTECTED AREAS IN THE KINGDOM

The Kingdom of Saudi Arabia has two policy documents: the National Biodiversity Strategy and Action Plan (NBSAP) and the Protected Area System Plan, which set national targets and a vision for Protected Areas in the Kingdom. Under the Saudi Green Initiative (SGI), the Kingdom has committed to protecting 30% of its terrestrial and marine areas and is working in partnership with leading international organizations such as the IUCN to safeguard and restore the country's natural ecosystems and landscapes.

The Kingdom has a long tradition of himas, which are areas of reserved pasture where trees and grazing lands are protected from indiscriminate harvest on a temporary or permanent basis. Formal conservation efforts began in Saudi Arabia after the Ministry of Agriculture and Water established the Asir National Park in 1981. The island of Umm Al-Qamari had been given *de facto* protected area status in 1977. The establishment of protected areas accelerated after the establishment of the National Commission for Wildlife Conservation and Development (NCWCD).

According to the World Database on Protected Areas (2024), supplemented by the national database, there are currently a total of 36 designated Protected Areas in the Kingdom. These cover 361,145 km^2 of terrestrial area (18.1%) and 14,382 km^2 of marine habitat (6.45%)

The conservation status in the Kingdom shows significant progress with more areas being proposed and/or being in the process of becoming formally protected areas.

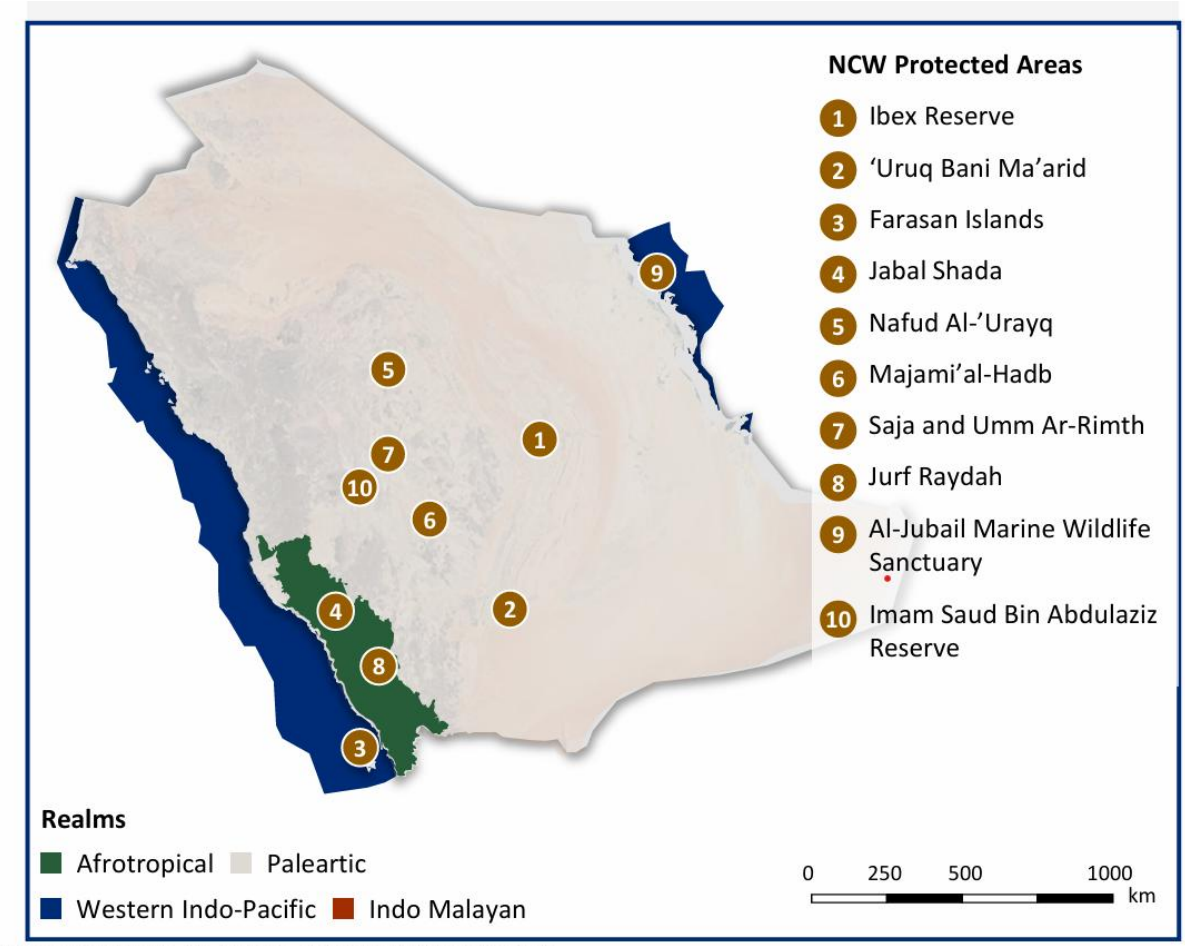
The Protected Areas in Saudi Arabia are managed by different authorities, including the National Centre for Wildlife (NCW), which has under its umbrella the 10.

1.4. INTRODUCTION TO THE 10 PROTECTED AREAS

The 10 areas for which Management Plans are currently being compiled each address specific conservation elements that have been identified in the System Plan. They complement each other through their different size, topography, landscapes, ecosystems, and biodiversity.

Table 1: Brief characterization of the 10 Protected Areas.

NAME OF PA	YEAR OF PROCLAMATION	SIZE KM^2	MAJOR ECOREGION PROTECTED	SECONDARY ECOREGION PROTECTED
Al-Jubail Marine Wildlife Sanctuary	1987	2,410	Southern Arabian Gulf	Arabian Gulf Coastal Plain
Ibex Protected Area	1987	1,840	Jabal Tuwayq	Rawdahs
'Uruq Bani Ma'arid	1992	13,485	Arabian sand desert	Jabal Tuwayq
Farasan Islands	1988	5,786	Southern Red Sea	Southern Tihamah Coastal Plain
Nufad Al Urayq Reserve	1994	2,900	Arabian Sand Desert	Granitic Outcrops
Jabal Shada	2001	78	Lower Asir Escarpment	Asir Escarpment Slope
Majami' al-Hadb	1991	1,190	Hijaz Hills & Mountains	Pyroclastic Outcrops
Saja and Umm Ar-Rimth	1994	6,528	Najd Pediplain	Inland Sabkhahs
Raydah	1988	9.95	Asir Escarpment Crest	Asir Escarpment Slope
Imam Saud Bin Abdulaziz Protected Area	1987	2,240	Najd Pediplain	Central Harrahs – Old



Source: NCW Data, ICS Analysis and Oliver Wyman Analysis

Map 1: NCW Protected Areas

1.5. MANAGEMENT PLAN OBJECTIVES

The National Center for Wildlife (NCW) requires an approved five-year management plan for each of its 10 protected areas, based on International Union for Conservation of Nature (IUCN) standards. The full objectives and structure of these plans are detailed in the Master Document.

1.6. AN OVERVIEW OF CONDUCTED FIELD VISITS

Two field visits were undertaken, a preliminary one on the 01/11/2023 and a follow-up on the 22 – 24/02/2024 inclusive. The visits were led by the National Center for Wildlife (NCW) and focused on consultations and site visits. The technical experts on those visits covered the disciplines of ecology and biodiversity conservation, Protected Area planning, including financial and organizational aspects, law enforcement, tourism planning and development, and stakeholder consultation.

threat and risk assessment was conducted, incorporating discussions with PA staff, management, field visits, and analysis of current management plans, maps, and geographical data. This process identified the prevalence and impact of threats, created a risk-level profile, and examined underlying causal factors and potential mitigation strategies. Additionally, on-site evaluations with rangers offered insights into the immediate pressures on specific locations and the limitations of current patrol strategies. A terrain, time, and distance appreciation exercise was undertaken to understand the size of the PA, its terrain and topography challenges as they relate to law enforcement, and the various threats and challenges.

SECTION TWO: LEGAL STATUS AND POLICY FRAMEWORK

2.1. CURRENT AND FUTURE POLICY FRAMEWORK

2.1.1. GENERAL LEGAL SETTING

The principles of Islam that include consideration of environmental protection and sustainability are enshrined within the legislation and constitution of Saudi Arabia. Article 32 of the Constitution of the Kingdom of Saudi Arabia says: "The State shall endeavor to preserve, protect and improve the environment and prevent its pollution."

In 2020, Saudi Arabia announced new comprehensive environmental legislation to replace the old General Environmental Regulations (GER) that were enacted in 2001 and revised in 2011. The new so-called 'Environmental Law' came into force on the 17 January 2021. The law is accompanied by several implementing regulations that cover the major environmental issues applicable to the Kingdom. The Environmental Standards formerly issued by the Presidency of Meteorology and Environment (PME) in 2011/12 remain applicable. In addition to the Environmental Law Environmental Law and its Executive Regulations that include Executive Regulations for Protected Areas, Sustainable Management of the Marine and Coastal Environment, Environmental Rehabilitation of Degraded Sites and Remediation of Polluted Sites, Vegetation Cover Development and Combating Desertification, Trade in Wildlife Species, Their Products and Derivatives; the list below provides additional legal and conservation instruments that are critical for protecting and ensuring sustainable use of wildlife and their habitats.

i) Raydah Protected Establishment Decree.
ii) National Biodiversity Strategy and Action Plan.
iii) Law of Endangered wild species and their product trafficking.
iv) Law of antiquities, museums and urban heritage 2014.
v) Law of Hunting Wild Animals and Birds and Executive Regulation for Hunting Terrestrial Wildlife Species.
vi) Law of Municipalities and Rural Areas 1977.
vii) Tourism Law and its implementation regulations.
viii) Cultural Heritage Law.
ix) National Protected Areas System Plan.
x) The Agriculture Law and its Implementing Regulation.
xi) Waste Management Law 2021 and its Executive Regulations
xii) And Others, that are related to the management of the Protected Area and its resources.

Together with the legal instruments, the Ministry of Environment, Water and Agriculture (MEWA) is the focal point for all environmental organizations. Five Centres now have responsibility for the protection and management of the wider environment:

- National Centre for Environmental Compliance (NCEC).
- The National Centre for Wildlife (NCW).
- The National Centre for Waste Management (NCWM).
- The National Meteorological Centre.

• The National Centre for the Development of Vegetation Cover and Combatting Desertification (NCDVCCD).

The 'Law of Antiquities, Museums and Urban Heritage' from 2014 governs the historical heritage of the Kingdom of Saudi Arabia. The executive regulation of this law regulates the relationship between the Antiquities and Urban Heritage sites—from one part—and development projects—on the other part—in all their respective forms.

Although not directly relevant to the Raydah Protected Area, there are several important legislative provisions concerning regulating activities in Saudi marine waters, including regulating and monitoring the aquaculture sector and regulating the fisheries sector.

The Kingdom has promulgated various Royal Decrees for the establishment and management of protected areas and directs the Ministry of Environment, Water, and Agriculture through the National Centre for Wildlife for their implementation.

The National Environment Law no 62300 dated 21-11-1441H and its subsidiary Protected Areas Regulations no 48824-1-1443 dated 5-2-1443H, articulate the definition of protected areas and the set of guidelines, and procedures pertaining to their establishment, management, and monitoring.

The main legal instrument that is relevant to the establishment of Raydah Protected Area is the "Executive Regulations for Protected Areas for the Environment System issued by the Royal Decree No. (M/ 165) on 19/11/1441 H.

This Decree grants NCW executive privilege to apply the provisions of the Decree to all protected areas administered or supervised by the Centre, within the Territory of the Kingdom, and for the issuing of licenses for private reserves, in accordance with the requirements and controls it sets.

2.1.2. INSTITUTIONAL SETTING

A National Registry for Protected Areas: Since 2021 a National Register for protected areas has been established with the issuance of the Royal Decree No. 26384 dated 22/4/1441 H (27/11/2021 G) instructing the registration and designation of all protected areas in the Kingdom to be undertaken by the NCW of the Ministry of Environment, Water and Agriculture (MEWA).

The schematic flowchart below illustrates the process for the designation and registration of protected areas in KSA:

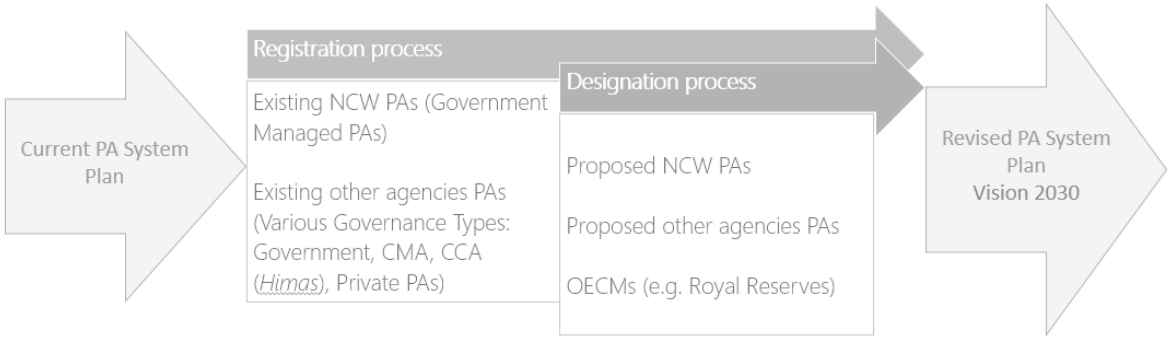


Figure 1: Designation and registration process for PAs in KSA

There may also be opportunities to have site-level policies contained in specific management plans.

2.1.3. PROTECTED AREA ESTABLISHMENT HISTORY

Date of establishment: Legal Gazettement: Conservation status for Raydah was declared on 25th May 1988 G (29/1/1419 H) by the National Commission for Wildlife Conservation and Development (NCWCD) Board of Governors. The NCWCD was a parastatal established in 1986 to develop and implement plans to preserve wildlife. Raydah was then formally proclaimed as a 'protected area' by the Cabinet of Ministers Decision No 77 dated 02/06/1417H (14/10/1996 G).

Though the areal extent of Raydah is 10 km2 given the steep gradient of the site the actual area is approximately 12 km2.

Raydah is currently managed by the National Centre for Wildlife (NCW) which was established in 2019 (Cabinet Decree Number 417) with a new and enlightened mandate and mission statement as part of the transformation of the Kingdom's environmental sector.

2.1.4. RECENT CONSERVATION DEVELOPMENTS

Imam Faisal bin Turki Royal Reserve: In October 2023 a royal decree was issued to establish "Imam Faisal bin Turki Royal Reserve" estimated to cover 30,150 km^2 (no figures given in Protected Planet) and which would span three administrative regions of Asir, Jizan and Makkah. It is understood that this new Royal Reserve will extend from the lip of the Soudah escarpment down to the Red Sea coast and coastal waters and so would include Raydah as well as the proposed Soudah Cloud Forest Reserve (SCFR) within its proposed boundaries.

Soudah Cloud Forest Reserve: This 200 km^2 reserve was proposed to extend protection to the juniper cloud forest ecosystem to underpin the development of high-end health and cultural tourism resorts being established on Soudah by the Soudah Development (a PIF company). The proposal included Raydah within its schematic boundaries and a holistic management plan for the Reserve has been developed and accepted by Soudah Development. The future of the SCFT is uncertain in the light of the proposed Royal Reserve.

***NCW Mission Statement:** "Preserving and developing wildlife, biodiversity, and ecosystems by enhancing community participation through comprehensive and effective programs to achieve environmental sustainability and maximize social and economic benefits".

2.1.5. PROTECTED AREA POLICY ENVIRONMENT

The Kingdom's revised protected area system plan, being readied for publication in 2024, outlines the process guiding the development of Saudi Arabia's national system of protected areas. The Plan recognizes that individual protected areas are the foundation of the system plan and collectively they help to balance the system plan's different conservation objectives.

The plan identifies the following objectives for a protected area's management:

- Conserve the composition, structure, function, and evolutionary potential of biodiversity.
- Contribute to regional conservation strategies (as core reserves, buffer zones, corridors, stepping-stones for migratory species, etc.).
- Maintain diversity of landscapes or habitats and their associated species and ecosystems.
- Be of sufficient size to ensure the integrity and long-term maintenance of the specified conservation targets or be capable of being increased to achieve this end.
- Maintain in perpetuity the values for which it was assigned.
- Be operating under the guidance of a management plan, and a monitoring and evaluation program that supports adaptive management; and
- Have a clear, effective, and equitable governance system.

2.1.6. INTERNATIONAL AGREEMENTS

At present Raydah is the sole representative of the African juniper cloud woodland ecosystem type in the Kingdom of Saudi Arabia.

The Protected Area forms an important and biodiverse bioclimatic refuge situated on the highest points in Saudi Arabia and provides suitable habitat for a significant number of Saudi Arabia's endemic and near-endemic species of plants and birds.

Important Bird and Biodiversity Area (IBA). Raydah is listed as an IBA based on the IBBA criteria met i.e.: A1. Globally threatened species, A2. Restricted-range species, A3. Biome-restricted species, B1: Species of conservation concern, B2: Species with most of their range restricted to a region B3: Regionally important congregations Regionally important congregations – bottleneck sites.

Ref. BirdLife International (2024) Important Bird Area factsheet: Taif escarpment. Downloaded from https://datazone.birdlife.org/site/factsheet/taif-escarpment-iba-saudi-arabia

Important Plant Area: The Juniper Forest in Raydah constitutes one of the seven 'Key Biological Sites' specific to KSA and is one of the 100-plus provisional Important Plant Area (IPA) sites that have been identified in Saudi Arabia, Oman & Yemen by the Centre for Middle East Plants (CMEP). IPA full site assessment for Raydah awaits completion. IPA programs are a response to Target V of the Global Strategy for Plant Conservation. Target V states, 'Protection of 50 percent of the most important areas for plant diversity assured'. Criteria for the Arabian region specifically include relict species and refugia for connectivity and climate change mitigation.

Ref. Important Plant Areas in Arabia | Centre for Middle Eastern Plants (cmep.org.uk)

World Heritage Nomination: Raydah will likely form part of the proposed WH serial site of bioclimatic refugia in western Arabia comprising the most important mountain crests, woodlands, and wetlands that harbor relict assemblages of plant and animal species in the western part of the Arabian Peninsula. The serial site spans the length of the Sarawat mountains within Saudi Arabia, from the Yemen boundary to the Jordan boundary. The serial site was submitted to be included on Saudi Arabia's Tentative List for Nomination UNESCO on 23/01/2023 as a Natural Site on Criteria vii, ix, and x.

If the serial site, including Raydah, is to be inscribed as a WHS, Saudi Arabia would have certain international obligations towards its protection, conservation, and management. Key obligations will include:

1. **Protection and Conservation:** States Parties are responsible for ensuring the protection, conservation, and preservation of the cultural and natural heritage sites within their boundaries. This includes taking appropriate legal, scientific, technical, administrative, and financial measures to safeguard these sites.
2. **Management and Planning:** Developing and implementing management plans that outline strategies for the conservation, presentation, and sustainable use of World Heritage Sites is essential. These plans should involve stakeholders, local communities, and experts to ensure effective management.
3. **Monitoring and Reporting:** States Parties are required to monitor the state of conservation of their World Heritage Sites and report regularly to UNESCO on their condition, any threats or changes, and the measures taken to address them.
4. **Legal Protection:** Putting in place legal frameworks and regulations to safeguard the sites from potential threats such as urbanization, pollution, natural disasters, climate change, and

unauthorized developments. This may involve establishing buffer zones, legal protections, and regulations governing the use of the site.

5. **Public Awareness and Education:** Promoting public awareness and understanding of the importance of World Heritage Sites, their significance, and the need for their protection. This often involves educational programs, interpretation centers, and community engagement initiatives.
6. **International Cooperation:** Collaborating with other States Parties, international organizations, and stakeholders to exchange information, expertise, and resources for the conservation and management of World Heritage Sites.
7. **Emergency Measures:** Taking immediate action in case of emergencies or sudden threats to the sites, such as natural disasters or armed conflicts, to minimize damage and ensure their recovery.

Each country's specific obligations and strategies for fulfilling them may differ based on the unique characteristics of their World Heritage Sites and their national capacities.

2.2. MANAGEMENT PLAN PA-SPECIFIC FRAMEWORKS

Two broad approaches, ecosystem restoration, and adaptive management, form the framework for the management of the RPA.

2.2.1. ECOSYSTEM RESTORATION FRAMEWORK

The United Nations Decade on Ecosystem Restoration defines ecosystem restoration as "the process of halting and reversing degradation, resulting in improved ecosystem services and recovered biodiversity. Ecosystem restoration encompasses a wide continuum of practices, depending on local conditions and societal choice." This broad scope of restoration activities generally aligns with the activities described as restorative in the Restorative Continuum.

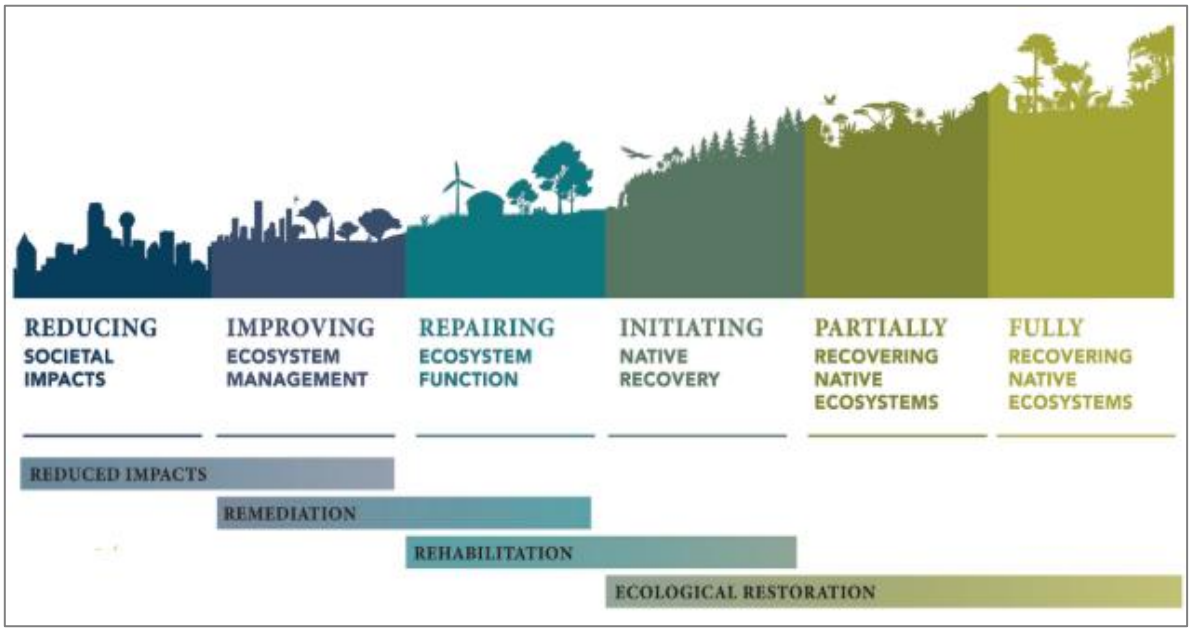


Figure 2: The restorative continuum from (Gann, 2019).

The framework promotes ten principles namely: good ecosystem restoration 1) contributes to global policy frameworks; 2) promotes fair and inclusive engagement; 3) includes a continuum of restorative activities;

4) aims at the highest recovery possible to benefit nature and people; 5) addresses the causes of degradation; 6) incorporates all types of knowledge; 7) sets ecological, cultural and socio-economic goals; 8) tailors activities to local and land/seascape contexts; 9) measures results and adapts actions; and 10) integrates policies and measures for lasting impacts.[1]

Since the paths and eventual outcomes of ecosystem restoration have in many cases no known reference framework or endpoint, restoration activities are best implemented through 'adaptive management'.

2.2.2. ADAPTIVE MANAGEMENT

Adaptive management is a decision process that promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. It is particularly well suited to environmental management where conditions change (e.g. good rains or drought) and outcomes are unpredictable. Key points of this approach are:

- Adaptive management openly acknowledges uncertainty about how ecological systems function and how they respond to management actions.
- Adaptive management is designed to improve understanding of how a system works, to achieve management objectives.
- Adaptive management is about taking action under desired outcomes.
- Adaptive management requires the participation of stakeholders

A full guide to the implementation of adaptive management may be found in (Salafsky, 2001). Adaptive management is seen as a dynamic cyclical process that continually learns and improves group understanding as one implements, monitors outcomes, analyses, learns, and then adapts management to improve the achievement of desired outcomes.

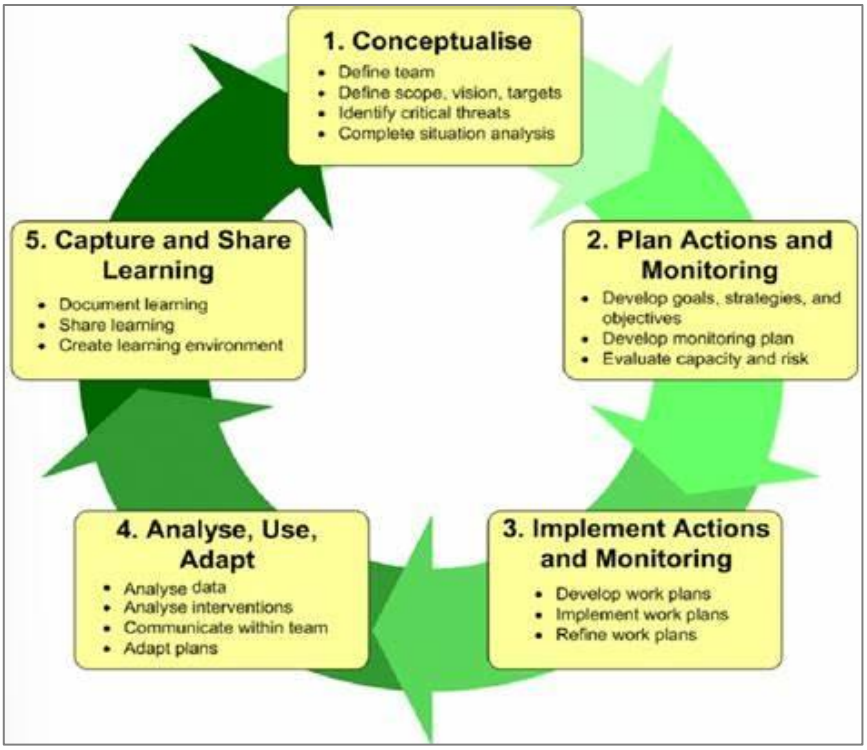


Figure 3: The 'Open Standards' Adaptive management cycle (CMP, 2020)

[1] https://www.ser.org/news/579457/Ten-Principles-Underpin-Good-Ecosystem-Restoration-throughout-the-United-Nations-Decade-2021-2030.htm

SECTION THREE: PROTECTED AREA ASSESSMENT

3.1. INTRODUCTION AND OVERVIEW OF THE RAYDAH PROTECTED AREA

3.1.1 OVERVIEW

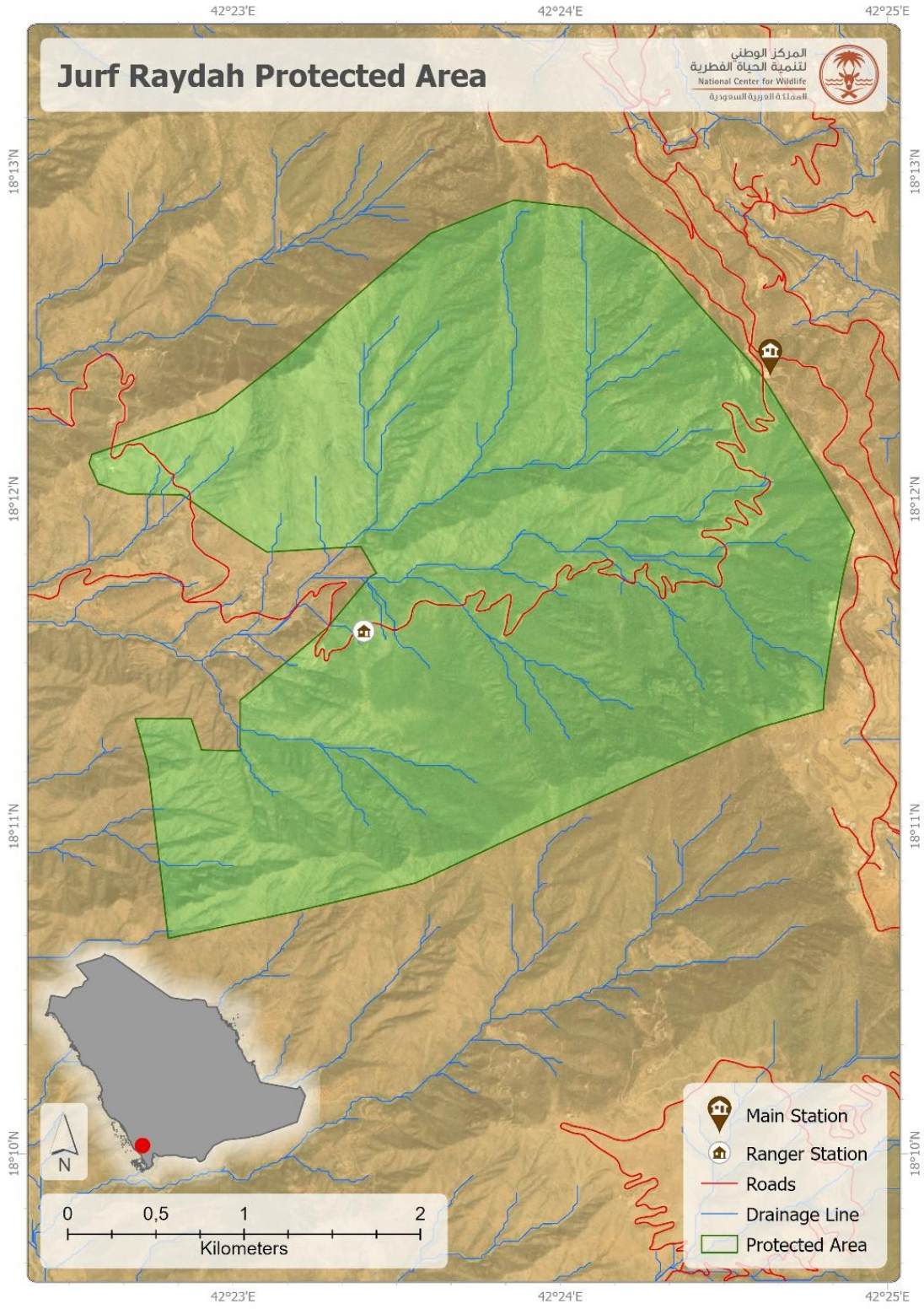
RPA is an important habitat for birds in southern Saudi Arabia's Asir Emirate, characterized by towering mountains and rich biodiversity inland of the coastline, established in 1988. The Raydah Cliff is mainly composed of moving igneous rock, steep slopes, and tributaries. It is the smallest Protected Area in Saudi Arabia, comprising an area of 10 km².

Raydah is part of the Arabian Shield, located in the southwest of Saudi Arabia, within the Sharwat Mountains, about 20km northwest of Abha, reaching up to 3,000m above sea level. With the highest rainfall in the Kingdom, the PA is distinguished by a distinctive density and diversity of vegetation cover, which includes juniper forests, wild olives, *Acacia gerrardii*, and several species of alien invasive cacti (*Opuntia spp*). Many tributaries descend from the top of the cliff and flow into the Shaayib and Raydah.

RPA is internationally regarded as an important bird and biodiversity area (IBA), 98 species have been recorded from the PA (Newton, 1996), including the Asir Magpie (*Pica asirensis*), which only occurs in a specific area of the Hard Mountains, and the native Arab woodpecker (*Picoides dora*).

Table 2: Overview of Raydah PA

Original Name	Raydah
World Database on Protected Areas (WDPA) ID number	19557
English Designation	Protected Area
IUCN Management Category	IV
Status	Designated
Type of Designation	National
Status Year	1988



Map 2: Raydah Protected Area.

3.1.2 ADMINISTRATIVE FEATURES

Reasons for Protection:

- Representative example of a wide altitudinal range of the 'Asir escarpment.

- At the time of proclamation perhaps the most intact example of juniper cloud forest in Saudi Arabia.
- Habitat for a significant number of Saudi Arabia's endemic and near-endemic plant and bird species.
- Especially important for conserving specific shrubs and endangered species

Management Authority:

- NCW (National Centre for Wildlife)

Management Objectives:

At the time of the proclamation, the management objectives were documented (Llewellyn, 2013):

- Maintain a biologically diverse juniper woodland ecosystem.
- Conserve and restore threatened species, including endemic plants and birds.
- Maintain relict and other plant communities without degradation.
- Safeguard the site watershed and soil-forming processes.
- Combat invasive cactus (*Opuntia spp*) threatening the PA's integrity.
- Restore degraded habitats.
- Enable local communities to benefit through the sustainable production of wild honey.
- Provide opportunities for scientific research, environmental education, recreation, and ecotourism.

Tenure:

- State, except for two privately owned properties.

Imarahs / Districts:

- 'Asir Imarah (Abha District, Markaz as-Sudah)

Nearest Cities (Population Over 100,000):

- Abha

Nearest Towns:

- Raydah Village, Al-Qa'wah, Al-Walajah, As-Suqa, Al 'Amir, Ash-Sharqah, Al-Hasd

Central Coordinates:

- Lat. 18° 12'N Long. 42° 24'E

Boundary Definition / Demarcation:

The Raydah boundary is defined by topographic features (ridgelines) and signs. The upper boundary follows roads immediately east of the escarpment crest and in places is marked by concrete stelae. The lower boundary follows the 1,700-meter contour east of the village of Raydah and the 1,640-meter contour south of the village but is not marked. The two other boundaries to the roughly rectangular area, on its NNW and the SSE sides, follow the ridgelines enclosing the watershed that is the Raydah Protected Area. Other boundaries follow ridgelines enclosing the watershed.

3.1.3 SOCIO-ECONOMIC FEATURES

The RPA is situated in a region where community relations are notably strong. The area benefits from good rapport among community heads, the National Center for Wildlife (NCW), local police, and municipal authorities. However, there is a clear disconnect between the youth and nature, indicating a significant need for educational programmes aimed at fostering environmental awareness and engagement.

3.1.3.1. ECONOMIC AND AGRICULTURAL CONTEXT

The Asir region, encompassing the RPA, is recognized for its agricultural significance due to its relatively temperate climate and annual rainfall of up to 20 inches (500 mm). The local economy is primarily driven by agriculture, with terraced cultivation of crops such as wheat, coffee, and vegetables being prevalent. Additionally, livestock farming, including cattle, sheep, goats, and camels, plays a crucial role in the regional economy. Besides the promising agricultural landscape, the Asir Mountains also hold untapped mineral resources such as nickel, copper, and zinc, which could influence future economic developments (Britannica, n.d.).

3.13.2. ECONOMIC PROFILE OF ABHA CITY

The city of Abha provides significant economic and infrastructural support to the surrounding areas, including the communities near Raydah PA. Despite a moderate productivity index score of 44.7% (see the table below), indicating some challenges in economic performance, Abha has strengths that can bolster regional development.

Table 3: Productivity Index (44.7%)

Sub-Dimension	Indicator	Actual	Units	Standardized	Comments
Economic Growth (63.4%)	City Product per Capita	14,037.33	USD (PPP) /Inhab	59.2%	moderate
	Mean Household Income	30,665.53	USD(PPP)	63.3%	M. Strong
	Old Age Dependency Ratio	6.81	%	67.8%	M. Strong
Employment (68.2%)	Employment to Population Ratio	52.89	%	50.3%	M. Weak
	Informal Employment	5.05	%	100.0%	V. Strong
	Unemployment Rate	6.44	%	54.4%	moderate
Economic Agglomeration (2.3%)	Economic Density	20,083,573	USD (PPP) /km2	2.3%	Under moderate

Source: Ministry of Municipal and Rural Affairs, 2019

The city shows moderately strong economic growth indicators (63.4%) and a relatively good employment situation (68.2%). However, the city struggles with low economic agglomeration and economic density, which hampers the potential for innovative and technological advancements. Additionally, Abha's productivity is constrained by a low employment-to-population ratio (50.3%), underscoring the need for enhanced job creation initiatives (Ministry of Municipal and Rural Affairs, 2019).

Infrastructure development in Abha is another area requiring attention, with an index score of 52.6% (see the table below).

Table 4: Infrastructure Development Index (52.6%)

Sub-Dimension	Indicator	Actual	Units	Standardized	Comments
Housing Infrastructure (55.5%)	Access to Electricity	84.90	%	83.8%	V. Strong
	Access to Improved Sanitation	52.18	%	43.7%	Under moderate
	Access to Improved Water	48.71	%	48.7%	Under moderate
	Access to Improved Shelter	47.41	%	47.4%	Under moderate
	Population Density	1,430.73	Inhab/Km2	9.5%	Under moderate
	Sufficient Living Area	100.00	%	100.0%	V. Strong
Social Infrastructure (20.8%)	Number of Public Libraries	0.23	#/100,000 inhab.	0.0%	Under moderate
	Physician Density	1.48	#/1,000 inhab.	41.6%	Under moderate
ICT (49.1%)	Average Broadband Speed	4.00	Mbps	28.9%	Under moderate
	Home Computer Access	77.20	%	77.2%	Strong
	Internet Access	41.10	%	41.1%	Under moderate
Urban Mobility (65.0%)	Average Daily Travel Time	21.90	minutes	100.0%	V. Strong
	Affordability of Transport	-	%	-	-
	Length of Mass Transport Network	-	Km/1M Inhab.	-	-
	Road Safety (traffic fatalities)	2.50	#/100,000 inhab.	95.0%	V. Strong
	Use of Public Transport	0.00	%	0.0%	Under moderate
Street Connectivity (72.4%)	Intersection Density	123.04	#/km2	100.0%	V. Strong
	Land Allocated to Streets	11.20	%	17.3%	Under moderate
	Street Density	63.30	Km/KM2	100.0%	V. Strong

Source: Ministry of Municipal and Rural Affairs, 2019

Although urban mobility and street connectivity are relatively strong, other aspects such as housing infrastructure and ICT access show weaknesses. The city's infrastructure challenges include limited access to water, sewerage, and internet services, which could impact overall living standards and economic growth.

In terms of quality of life, Abha City fares moderately well with an index score of 64.5% (see the table below).

Table 5: Quality of Life Index (64.5%)

Sub-Dimension	Indicator	Actual	Units	Standardized	Comments
Health (73.1%)	Life Expectancy at Birth	83.76	years	72.5%	Strong
	Eradicate Maternal Mortality	43.75	#/100,000 live births	58.2%	moderate
	Eradicate Under-5 Mortality	48.71	#/1000 live births	68.3%	M. Strong
	Vaccination Coverage	47.41	%	93.2%	Very Strong
Education (59.5%)	Early Childhood Education	9.54	%	7.2%	Under moderate
	Net Enrolment in Higher Education	100.00	%	40.7%	Under moderate
	Literacy Rate	0.00	%	99.5%	V. Strong
	Mean Years of Schooling	41.62	%	90.7%	V. Strong
Safety and Security (89.0%)	Homicide Rate	28.94	#/100,000 inhab.	78.0%	Strong
	Theft Rate	77.20	#/100,000 inhab.	100.0%	V. Strong
Public Space (36.2%)	Green Area per Capita	41.10	m2 / inhabitant	64.7%	M. Strong
	Accessibility to Open Public Space	100.00	%	7.8%	Under moderate

Source: Ministry of Municipal and Rural Affairs, 2019

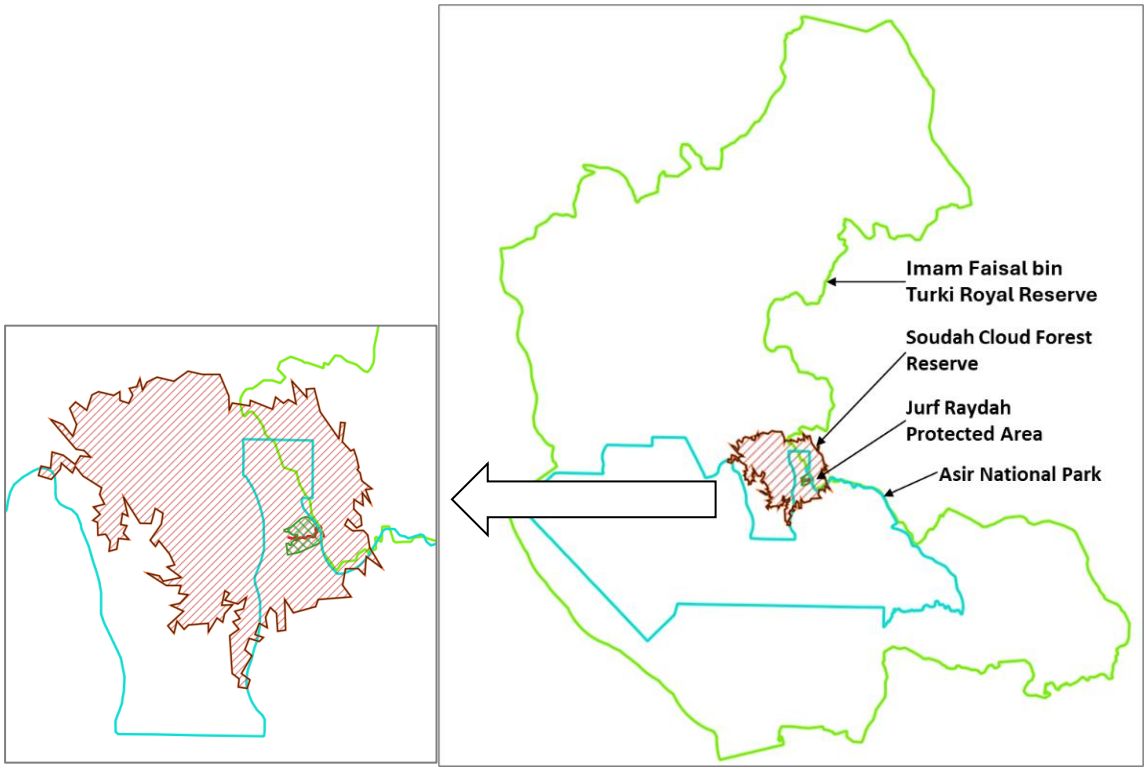
The city excels in safety and security (89%), healthcare provision (73%), and access to quality education (60%). However, public space accessibility remains a significant concern, with only 8% of available public spaces being adequately accessible, despite their presence being noted at 65%. Public spaces are crucial for community engagement and overall quality of life, and their limited accessibility in Abha suggests an area needing further development (Ministry of Municipal and Rural Affairs, 2019).

3.1.4 INTERNATIONAL AGREEMENTS

Refer to section 2.1.6. International Agreements

3.2. CONTEXT AND ACCESSIBILITY

At this juncture, it is critical to record that Raydah exists within a complex of other declared protected areas.



Map 3: Raydah in the context of other protected areas that surround it.

At the regional scale, the PA is surrounded by the newly declared Imam Faisal bin Turki Royal Reserve (https://www.protectedplanet.net/555785932 and https://www.asda.gov.sa/en/projects/imam-faisal-bin-turki-royal-reserve/). Within this is the Asir National Park (https://www.protectedplanet.net/864) and overlapping with and also encompassing Raydah is the Soudah Cloud Forest Reserve (not registered on Protected Planet, but see https://soudah.sa/en/soudah-development-newsroom/hrh-crown-prince-launches-soudah-peaks-masterplan). While the Royal Reserve is in the active planning stages in close collaboration with the Aseer Development Authority (ASDA), and Soudah Cloud Forest Reserve progresses under a commercial model, little information or planning and implementation evident regarding the Asir National Park. Purely for efficiency, it is critical the conservation and tourism planning and implementation be undertaken collaboratively with the authorities identified above.

3.3. MANAGEMENT RESOURCES AND INFRASTRUCTURE

3.3.1. FINANCIAL RESOURCES

The financial resources are principally underpinned by government funding, constituting its fiscal resources' mainstay. The Protected Area is not equipped with an autonomous finance department, nor does it employ a financial manager; instead, these functions are centralized at the national level. Income derived from visitor and tourism activities is directed into national revenue and is not retained by the Protected Area. Salaries, capital outlays, and operational expenditures are disbursed from national funds. The allocated budget is considered sufficient for the protected area needs.

3.3.2. HUMAN RESOURCES – STAFFING

The RPA is staffed by an Area Manager, a Deputy Area Manager, and an Administrative Unit Head who oversee strategic planning, day-to-day operations, and administrative tasks. The ranger team, led by a Head Ranger with support from a Deputy Head Ranger, is responsible for access control and area integrity, patrolling, human-wildlife conflict issues, monitoring wildlife, enforcing regulations, and engaging with local communities and visitor. A Botanist manages the nursery, focusing on plant conservation and reforestation efforts, while a Secretary and Cook provide essential administrative and logistical support. The staff faces challenges such as managing baboon overpopulation, controlling the invasive species *Opuntia ficus-indica*, and ensuring visitor safety on the Protected Area's steep and dangerous roads. The team also strives to balance conservation goals with the needs of local communities, providing sustainable resource use while protecting the Protected Area's unique biodiversity.

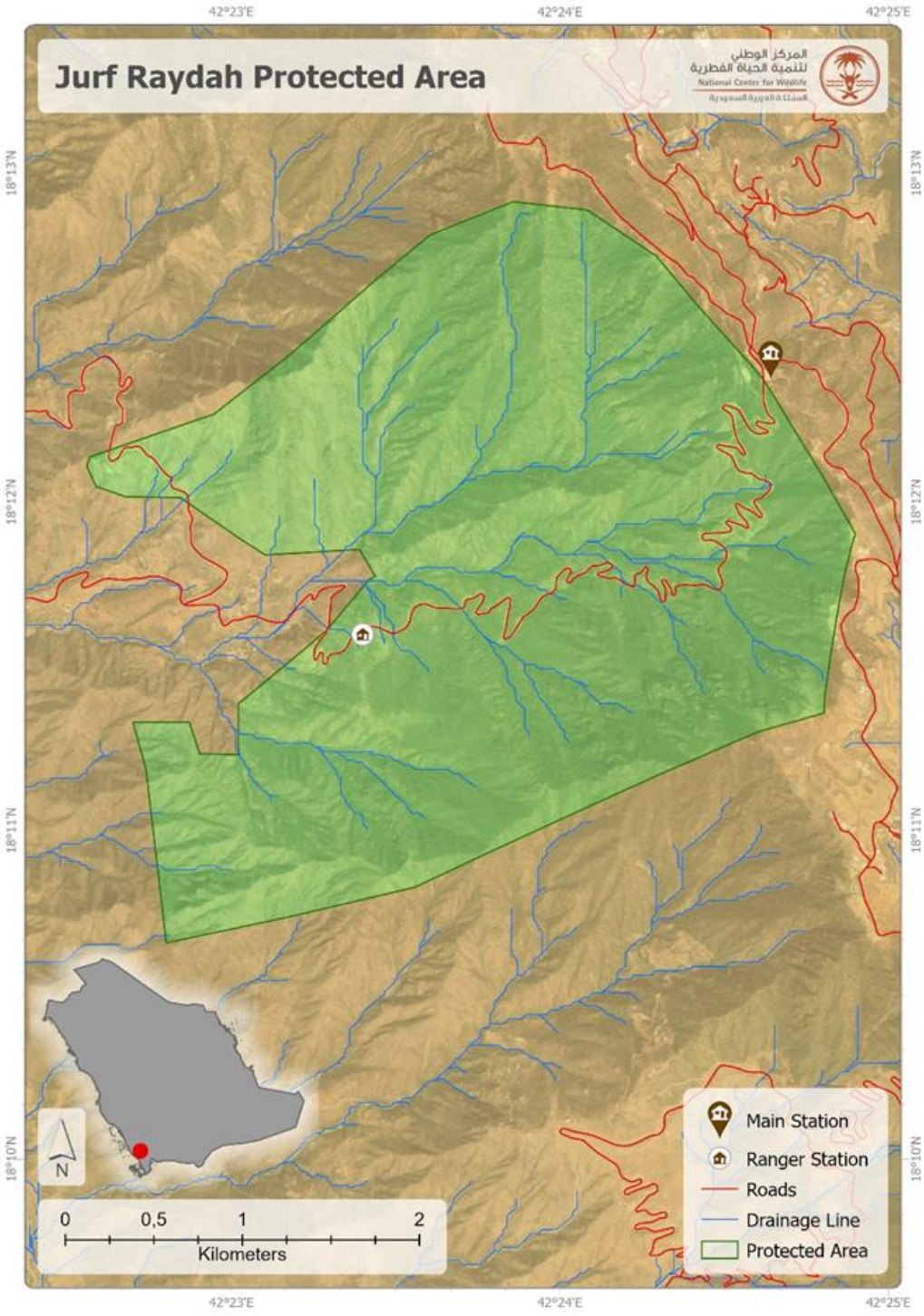
Table 6: Current Staffing

DEPARTMENT	QUANTITY	TITLE	ROLE
Management	1	Area Manager	Overall responsibility for the PA, strategic planning, and leadership.
Rangers	1	Head of Patrol Unit	Leads the ranger team, coordinates conservation activities, and oversees law enforcement.
	9	Rangers	Engaged in fieldwork, patrolling, monitoring wildlife, and enforcing PA regulations. Certain rangers have been assigned roles, including. Admin duties, Tourism relationships, and Community partnership.
	1	Community and Tourism Liaisons	Engage with local communities and manage tourism-related activities
	1	Environmental Control Unit	Monitors environmental conditions and collects data
Other	1	Housekeeper & cook	Responsible for cleaning ranger stations and preparing meals for staff
	1	Botanist	Manages the nursery, responsible for propagating and maintaining Indigenous plant species, conducting botanical research, and supporting reforestation efforts

3.3.3. EQUIPMENT & VEHICLES

The RPA currently has seven vehicles essential for patrolling, conservation, and general management, particularly given the steep terrain. The limited equipment inventory for habitat management, nursery operations, and maintenance requires expansion to meet future objectives. Strategic upgrades, including acquiring specialized vehicles and tools, are necessary to ensure that each department is fully equipped to handle the growing demands and challenges of Protected Area management.

3.3.4. INFRASTRUCTURE



Map 4: Infrastructure

The primary infrastructure within the RPA includes a well-equipped ranger station strategically located adjacent to the Protected Area's access road at the escarpment's edge. This facility comprises two main buildings, a tent, two portacabins, and a nursery dedicated to cultivating juniper and other indigenous seedlings. A former police checkpoint, situated directly across from the portacabins, has been repurposed by the NCW for administrative and operational use. An additional portacabin is available to accommodate visitors and research staff.

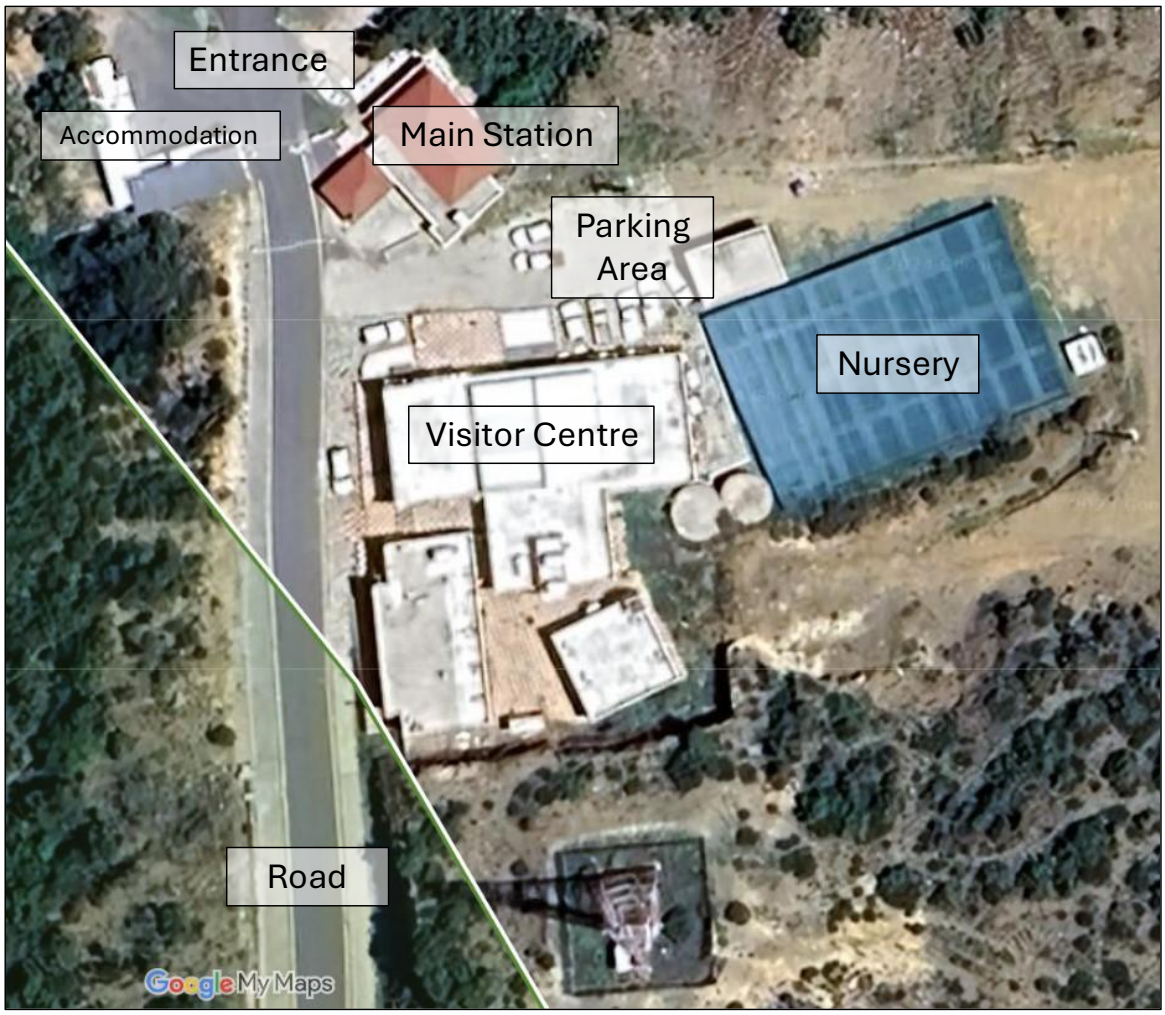


Figure 4 Main Station Infrastructure

The PA features a single paved road that descends from the escarpment, providing essential access to the village of Raydah located below the Protected Area's lower boundary. This road requires periodic regrading, particularly after heavy rains or rockfalls, to maintain safe access. Within the Protected Area, there are two small active farms situated at an elevation of approximately 2,400 to 2,450 meters above sea level, featuring a series of small fallow terraces and several traditional earthen-floored dwellings. Adjacent to the ranger station, a privately owned football pitch, and picnic area, while not officially part of the Protected Area, also contributes to the local landscape.

Additionally, a small picnic site and viewpoint provide modest facilities for visitors. Despite the limited size and scope of the current infrastructure, it adequately supports the Protected Area's existing needs but will require expansion and upgrades to meet future conservation and management goals.

Map 5: Infrastructure component

INFRASTRUCTURE COMPONENT	DETAILS
Ranger Station	Located at the lip of the escarpment, it includes two main buildings, portacabins, and a tent.
Nursery	Dedicated to propagating indigenous trees, especially juniper, managed by a Botanist.

Picnic Site/Viewpoint	Small, basic facilities are available for visitors to enjoy the scenic views.
Vehicles	A fleet of seven vehicles is used for patrolling, conservation activities, and general management.

3.4. PHYSICAL ENVIRONMENT ANALYSIS

3.4.1 TOPOGRAPHY

The PA spans an altitudinal range of 1341 meters above sea level (m asl) with its lowest point at 1482 m asland and highest point at 2823 m asl at the lip of the Raydah escarpment. The Protected Area boundary encompasses a single catchment (the Sha'ib Raydah watershed) which drains into the Wadi Maraba at about 1,340 m asl.

Table 7: Altitudinal mean and range for Raydah PA.

NAME	Min Elevation (m asl)	Mean Elevation (m asl)	Max Elevation (m asl)
RPA	1482	2153	2823

Slopes are steep with 57% of the Protected Area having slope angles of 30° or more (Refer A.7.2.2. for more details).

3.4.2 GEOLOGY AND SOILS

Raydah occurs on the geological formations of the Arabian Shield, which consists of unstable metamorphic rocks comprising Precambrian greenstone as pillow lava, locally schistose, with minor slate, phyllite, and conglomerate. Due to the steep slopes associated with this escarpment, weathered material is rapidly transported down the slope leaving shallow rock lithosols over most of the protected area.

3.4.3 HYDROLOGY

The PA boundary corresponds closely with the boundary of the Sha'ib Raydah watershed, an ephemeral stream that is a tributary of Wadi Maraba. Heavy rains generate flash floods at the lower extent of the precipitous terrain. Although the bedrock is crystalline, it is fractured, giving rise to perennial seeps in several ravines in the Protected Area (Llewellyn, 2013).

3.4.4 CLIMATE

The climate is characterized by cool summer (June, July, and August) with average temperatures of just over 25°C. Winters are cooler with average temperatures 15 and 16°C in December and January. Rainfall peaks in spring (March and April) with an average of 45mm falling in each month. Winter rain from September through to February averages 10mm per month. Spatially, rainfall varies from 227mm at the lower-lying western edge of the PA to 295mm at the higher-lying eastern edge of the PA. The average annual rainfall across the PA is 241mm. Wind speeds are generally low, peaking in March with an average of 13.1 $km.hr^{-1}$.

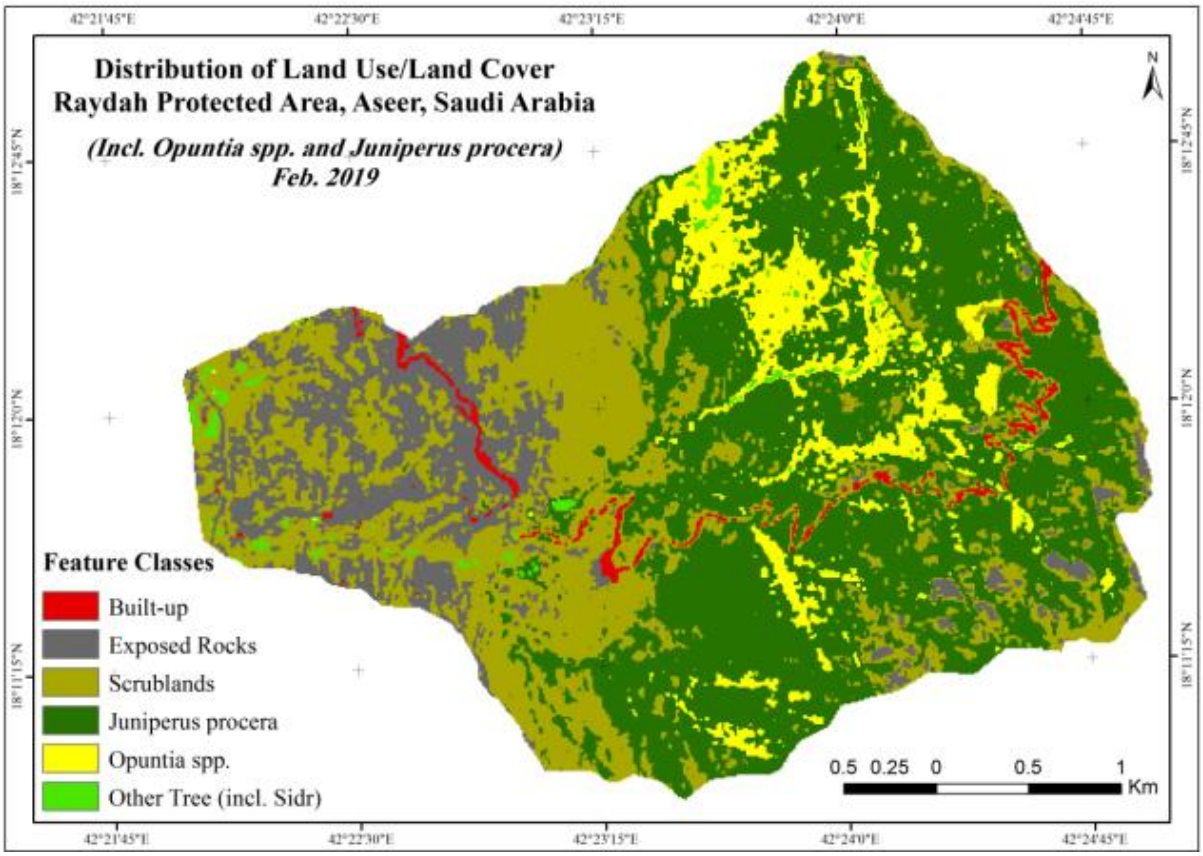
3.5. BIOLOGICAL ENVIRONMENT ANALYSIS

3.5.1 ECOSYSTEM CHARACTERISATION

The RPA falls into the Southwest Arabian Montane Woodlands and Grasslands ecoregion (Olson, 2001) (updated 2017). At a finer scale, the PA is representative of two ecosystem types mainly associated with their altitudinal, rainfall, and other climatic variables. At a finer scale still, Alwadai (2019), based on satellite image analysis subdivided the surface cover of Raydah into five classes apart from built-up or transformed habitat namely:

Types of habitats found in RPA.

Habitat	Extent (%)
Built-up	1.45
Exposed rocks	12.66
Shrublands	30.62
Juniperus procera	45.00
Opuntia sp.	9.33
Other trees (including Sidr - Ziziphus spina-christa)	0.94



Map 7: Land cover of Raydah Protected area from Alwadai (2019).

A gradient analysis by Ghazal (2015) delineated four high-level plant communities of which two fell in the semiarid mountainous region namely Escarpment and High Mountain. The escarpment comprised three associations featuring semiarid *Acacia*-dominated vegetation while the high mountain community comprised three associations dominated by *Juniperus* forests and bushlands.

3.5.2 PLANTS

The Raydah escarpment of which Raydah PA does not form a part, has qualified as a Key Biodiversity Area of international significance. The site holds a significant population of the following plant species which, although not yet Red-List-assessed at the global level, are endemic to the Hotspot and may be categorized as globally threatened once assessed (thus meetin g the KBA Vulnerability criterion), based on existing

regional or national Red List assessments: *Albuca pendula, Aloe edentata, Aloe sabaea, Centaurothamnus maximus, Cichorium bottae, Huernia saudi-arabica*[2].

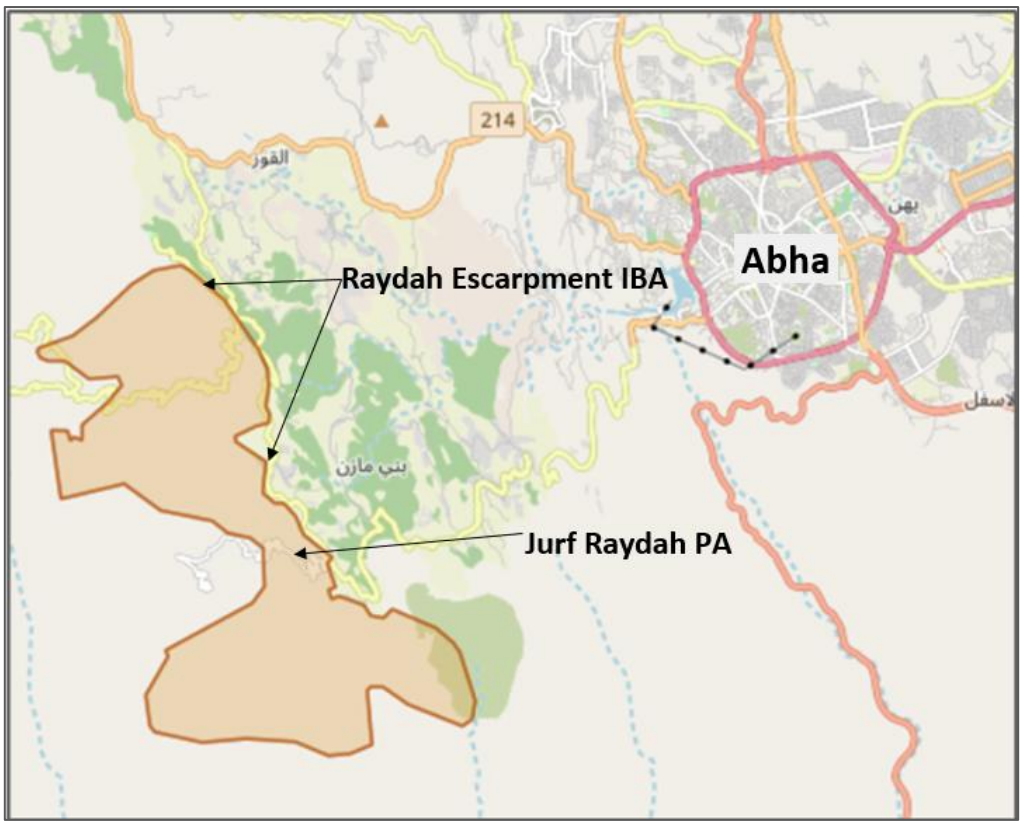
3.5.3 PROBLEM PLANTS

The extent of the protected area encroached by *Opuntia spp.* Identifies this alien invasive species as the most prominent threat to the biodiversity and integrity of the protected area. Alwadai (2019) estimated that 9.3% of the PA was covered by *Opuntia spp.*

3.5.4 ANIMALS

Birds:

RPA forms approximately 35% of and is encompassed by the Raydah Escarpment Important Bird Area (SA030) which is situated along the Raydah escarpment approximately 15 km southwest of the city of Abha.



Map 8: Location of the Raydah Escarpment

The citation extracted from the listing[3] reads: "Possibly the most important compact site in Saudi Arabia for south-west Arabian endemic, and other, woodland species". Other breeding species include *Accipiter badius* (1-2 pairs), *Aquila verreauxii, Columba arquatrix* (probable), *Streptopelia lugens, Treron waalia, Otus scops pamelae, Monticola rufocinereus, Phylloscopus umbrovirens, Terpsiphone viridis, Zosterops*

[2] Key Biodiversity Areas Partnership (2024) Key Biodiversity Areas factsheet: Raydah escarpment. Extracted from the World Database of Key Biodiversity Areas. Developed by the Key Biodiversity Areas Partnership: BirdLife International, IUCN, American Bird Conservancy, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Re:wild, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, World Wildlife Fund and Wildlife Conservation Society. Downloaded from https://keybiodiversityareas.org/ on Aug 3, 2024.

[3] BirdLife International (2024) Important Bird Area factsheet: Raydah escarpment. Downloaded from https://datazone.birdlife.org/site/factsheet/raydah-escarpment-iba-saudi-arabia on 11/08/2024.

abyssinicus and *Pica pica asirensis*. There may be a considerable raptor passage through the area, and many *Sylvia* (especially *S. atricapilla*) stop off on migration. Many warblers winter, especially *Phylloscopus collybita*". A total of 16 bird species meets international IBA criteria and the site (see appendix A.7.2.5.).

Mammals:
Recorded species include hamadryas baboon, Arabian wolf, striped hyaena, Arabian red fox, caracal, wild cat, feral cat, small-spotted genet, honey badger, Indian crested porcupine, gerbil species, king jird, spiny mouse, rock rat and various bat species, including Geoffroy's bat and the Ethiopian epauleted fruit bat.

Note: The presence of rock hyrax and Arabian hare is not confirmed, and long-term monitoring is needed to document reptiles, amphibians, and invertebrates in the PA.

3.5.5. RARE AND THREATENED SPECIES

Rare and endangered species have been identified Suffice it to say that birds contain the largest number of red-list species with one, the Asian Magpie being Endangered and another three listed as Near Threatened. Two species of mammal are listed as Near threatened and potentially another two transient species (leopard and ibex) are Critically endangered and vulnerable, respectively. In terms of the ecological restoration and management of the PA over the next five years, priority must be given to the re-establishment and management of the red-listed species in a collaborative effort with the other protected area initiatives that encompass RPA.

3.6. TOURISM ASSETS, ACTIVITIES AND USE

- About 5700 visitors in 2023,
- Spectacular views with (2 trail Path, Observation platform, and picnic areas, campsite)
- Birding opportunities (bird day tour organized yearly)
- Limited parking space

3.7. SOCIO-CULTURAL AND HERITAGE ASSETS

Cultural heritage and historic attractions include:

- Two historic castles (Husn Al Mujaththal and Husn Al 'A'id), old settlements, and terrace agriculture in Raydah village at the western edge of the Protected Area.
- Turkish watch towers.
- A documented history of the area surrounding the PA.
- A largely traditional agrarian village culture on the western boundary of the Protected Area – Raydah village and associated small-scale farm settlements.

3.8. STAKEHOLDER ANALYSIS

The stakeholder analysis approach for Raydah PA was based on the existing management plan (NCW 2021) and uses the influence-interest analysis methodologies. Each stakeholder was assessed in terms of their level of influence in the PA management decisions and their level of interest in conserving and sustaining its natural heritage values and attributes. The assessment resulted in four types of stakeholders: the core stakeholders who have high influence - high interest level, the potential stakeholders who have low influence – high-interest level, the critical stakeholders who have high influence - low interest level, and the marginal stakeholders who possess low influence - low-interest level. The matrix below provides the stakeholder analysis results.

Table 8: Summary of key Raydah PA stakeholders

ENTITY NAME	ROLE	CATEGORY	LEVEL OF INFLUENCE	LEVEL OF INTEREST
Government Entities				
National Center for Wildlife	NCW plays a critical role in safeguarding Saudi Arabia's rich biodiversity, ensuring the sustainable use of natural resources, and promoting harmony between human activities and the conservation of wildlife and their habitats.	Strategic Partner	High	High
Ministry of Environment, Water, and Agriculture	Responsible for environmental policy, regulations, and conservation efforts.	Strategic Partner	High	High
Special Forces for Environmental Security	Responsible for enforcement of environmental and wildlife regulations	Strategic Partner	High	High
PA Management and Rangers	On-the-ground knowledge of threats and opportunities	Strategic Partner	High	High
Saudi Environmental Society	Works on environmental awareness, education, and sustainable development	Interest Group	Low	Low
Saudi Standards, Metrology, and Quality Organization	Sets standards and regulations for environmental conservation and sustainability	Interest Group	High	Low
National Center for Waste Management (MWAN)	Responsible for waste management within the KSA	Interest Group	High	Low
Ministry of Tourism (MoT)	Responsible for investment, development, and licensing.	Interest Group	High	Low
Heritage Commission	Responsible for advancing and preserving the heritage sector in the Kingdom	Interest Group	High	Low
Local Police	Security and law enforcement	Interest Group	High	Low
Judicial system	Legal and social with limited support to the PA	Interest Group	High	Low
Municipalities	Local development focuses on and around rural areas with limited support from the PA.	Strategic Partner	High	High
Private Sector				
Saudi Investment Recycling Company (SIRC)	Tasked with developing recycling industries and a circular economy	Secondary Stakeholder	Low	Low
Renewable Energy Companies	Increasingly important stakeholders focusing on sustainable energy solutions.	Secondary Stakeholder	Low	Low
Saudi Investment Recycling Company	The company is tasked with developing recycling industries and a circular economy.	Secondary Stakeholder	Low	Low
Local hotels and restaurants	Hotels and restaurants in the adjacent communities.	Enabler	Low	High
Tourism Private Sector	Tourism service companies provide guided and non-guided tourism packages to local and international clients.	Enabler	Low	High

ENTITY NAME	ROLE	CATEGORY	LEVEL OF INFLUENCE	LEVEL OF INTEREST
NGOs and Civil Society				
Environmental Advocacy Groups	Organizations focused on biodiversity, conservation, and sustainable development.	Strategic Partner	High	High
Community-Based Organizations	Engaged in grassroots initiatives and local conservation efforts.	Enabler	Low	High
Religious leaders and preachers	Religious and social with limited support to the PA	Enabler	Low	High
Academic and Research Institutions				
Universities and Research Centers	Conduct studies on environmental issues, provide expertise, and contribute to policy recommendations.	Enabler	High	High
Schools	Social focus with good support for the PA concept	Enabler	Low	High
General Public and Visitors				
Local Communities	Directly affected by environmental policies and initiatives and can play a role in advocacy and implementation.	Enabler	Low	High
Community Leaders and Opinion Leaders	Shape public perception and discourse on environmental issues.	Enabler	Low	High
Livestock owners	Economic and social focus with a high level of hostility towards the PA	Enabler	High	Low
Visitors – elite groups	Special interests with high support for the PA	Enabler	Low	High
Visitors – regular	General interests in recreation with limited awareness of the PA's importance	Enabler	Low	High

The PA relies on its stakeholders to guide, manage, support, and protect it. Communities, particularly those reliant on the PA's natural resources, play a critical role in the success or failure of a plan.

To ensure effective management and conservation of Raydah, NCW must collaborate closely with the various PA management authorities that encompass the Raydah PA. This includes a strategic partnership with the Asir Development Authority, the responsible authority for the Imam Faisal bin Turki Royal Reserve. Such collaboration will promote the alignment of conservation strategies, enhance resource management, and facilitate the seamless implementation of policies across the different jurisdictions within Raydah PA.

There is a wide cross-section of stakeholders in Saudi Arabia which can be summarized as follows:

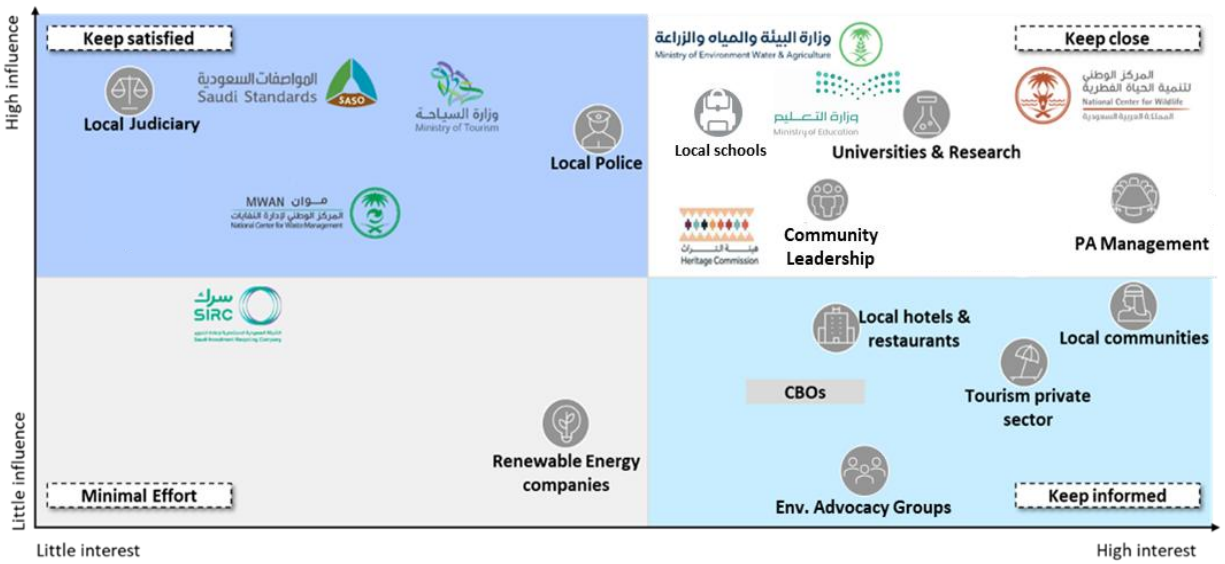


Figure 5: Raydah PA stakeholder profile.

Stakeholder analysis should be a regular exercise, where the effectiveness and the outcomes of the engagements are evaluated, and the results are used to redefine the stakeholders.

3.9. CURRENT THREATS AND PRESSURES

The Raydah Protected Area is facing various threats and pressures that put its biodiversity and ecological integrity at risk. These challenges include the overpopulation and nuisance impact of baboons, invasive plant species such as *Opuntia*, the risks posed by steep and hazardous roads, and the impacts of unregulated grazing. In addition, potential forest fires, soil erosion, and feral cats present further complications. To address these threats, targeted mitigation strategies have been developed. This includes implementing a comprehensive baboon management plan, controlling invasive species, improving road

safety measures, and enforcing sustainable grazing practices. It is crucial to address these threats to safeguard the Protected Area's unique habitats and ensure its long-term conservation.

Two methods were used to identify threats and pressures. The first involved a spatial evaluation of biodiversity hotspots and high-pressure areas, which highlighted conflicts between them. The second method used a 5x5 risk ranking matrix to prioritize threats.

The second approach used interviews, field visits, incident registers, reports, available literature, and meetings with local leadership and stakeholders to identify and evaluate threats and pressures based on their likelihood of occurrence and potential severity of impact.

Likelihood		Consequence				
		Negligible	Minor	Moderate	Major	Severe
Almost certain	90% and higher likelihood of occurring	11	16	20	23	25
Likely	Between 30% and less than 90% likelihood of	7	12	17	21	24
Possible	Between 10% and less than 30% likelihood of	4	8	13	18	22
Unlikely	Between 3% and less than 10% likelihood of	2	5	9	14	19
Rare	Less than 3% likelihood of occurring	1	3	6	10	15

Table 9 Threat Ranking Matrix

THREAT/PRESSURE	DESCRIPTION AND NOTES	LIKELIHOOD (1-5, NONE TO EXTREME)	CONSEQUENCE (1-5, NEGLIGIBLE TO CRITICAL)	RANKING AS PER 5X5 RISK MATRIX
Overpopulation of Baboons	This is highly likely due to current trends, which significantly impact biodiversity and local communities. The overpopulation of baboons directly impacts the Protected Area's ecosystems and leads to ongoing human-baboon conflicts in nearby villages, raising potential reputational risks.	Almost Certain (5)	Major (4)	High (20)
Invasive Opuntia	Difficult to control, with severe consequences for ecosystem health. The widespread infestation of Opuntia threatens the ecological balance and integrity of habitats, making it one of the most critical issues to address.	Likely (4)	Catastrophic (5)	High (20)
Roads and New Construction	There is a high likelihood of landslides, erosion, and rockslides due to the steep terrain. New construction poses significant safety and environmental risks, requiring careful management to prevent further damage.	Likely (4)	Major (4)	High (16)
Dangerous Steep Road	There is a high likelihood of incidents due to the steep and challenging terrain, with serious safety and management implications for both	Likely (4)	Major (4)	High (16)

THREAT/PRESSURE	DESCRIPTION AND NOTES	LIKELIHOOD (1-5, NONE TO EXTREME)	CONSEQUENCE (1-5, NEGLIGIBLE TO CRITICAL)	RANKING AS PER 5X5 RISK MATRIX
	visitors and staff. The road's condition poses a significant risk and challenges in traffic management.			
Climate Change	Long-term threat with potentially severe impacts on the Protected Area's primary habitat. The dieback of juniper at lower altitudes, possibly related to regional climatic changes, poses a significant risk to vegetation and habitats.	Possible (3)	Catastrophic (5)	High (15)
Soil Erosion	There is a moderate likelihood, but it can lead to significant landscape changes. Runoff along roads within the Protected Area is causing soil erosion, further degrading the natural landscape and vegetation.	Possible (3)	Major (4)	Moderate (12)
Feral Cats	Predation is highly likely, with a moderate impact on bird populations. Feral cats directly threaten the Protected Area's avian species, necessitating management action to protect these populations.	Likely (4)	Moderate (3)	Moderate (12)
Forest Fire	Low likelihood but high consequence. Although the risk of forest fires is relatively low, any occurrence could have catastrophic consequences for the Protected Area's ecosystems, making it a critical concern.	Unlikely (2)	Catastrophic (5)	Moderate (10)
Roadworks and Repairs	There is a moderate likelihood of moderate consequences, depending on the extent of repairs. Future road repairs within the Protected Area could impact adjacent forests and cause further environmental damage, necessitating careful planning.	Possible (3)	Moderate (3)	Moderate (9)
Farm Inside the Protected Area	This is a Low-to-Moderate threat that could escalate if farm activities intensify. The farm within the Protected Area presents competing land use challenges, disturbances, and aesthetic impacts.	Possible (3)	Moderate (3)	Moderate (9)
Litter	Low to moderate threat, primarily an aesthetic and minor ecological issue. Litter from nearby areas, including the picnic sites, sometimes spills into the Protected Area, affecting its appearance and potentially harming wildlife.	Possible (3)	Minor (2)	Low (6)

3.10. SITUATIONAL ANALYSIS SYNOPSIS AND SWOT

A SWOT analysis was conducted through various stakeholder engagements and by the specialist team. The following summarizes some of these key aspects that contributed to developing the vital attributes of the RPA.

Table 10: SWOT Analysis for RPA.

	STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
Biodiversity Conservation	• Relatively intact Juniper forests and bushlands. • Diverse vegetation traversing along an altitudinal gradient. • High diversity of plant and bird species (Asir Escarpment IBA). • A small haven for red-listed birds and transient mammals. • Falls within an area of high reptile species richness and moderate species endemism.	• No strategic waste management plan.	• Develop stronger links with other local and regional conservation initiatives – develop and implement wide area conservation strategies. • Develop stronger links with research institutions to understand Juniper population dynamics, e.g., King Khalid University in Abha. • Strengthen the research position to establish feedback for adaptive management.	• Invasive Plant Species - *Opuntia spp.* Covering> 9% of the PA. • Human-wildlife conflict and the associated socio-ecological impacts. • Erosion is associated with poor road and trail planning, alignment, and management. • Increased predation pressure on birds by feral cats.
Responsible Visitor Management and Sustainable Tourism Development	• The city of Abhah, less than 30 minutes from the Protected Area, provides modern amenities, accommodations, and restaurants. • Easily accessible from local towns and villages via good quality asphalt roads. • 25 min by car from the city of Abha, which in turn is a 1h30 flight from Riyadh and a 1h flight from Jeddah. • The area falls within a high-elevation zone and thus experiences unique climatic conditions that can potentially attract visitors, especially during hot summers elsewhere in the KSA. • Formal entrance gate and access control.	• No financial returns from tourism • Difficult access due to challenging tern. • Restricted access. • Poor marketing. The Protected Area has a very low online presence and is largely unknown as a destination in the regional and international travel market.	• Vision 2030 would likely help to improve and market the destination, a situation that will attract more tourists to the destination. • Prudent and environmentally responsible facilitation of a range of appropriate activities and experiences. • Having extreme environmental conditions compared to other parts of the Kingdom would likely attract visitors. Vast scope to provide appropriate, judiciously planned nature and culturally based activities, including short walks, hiking trails, trails, mountain biking trails, homestay and	• Tourism is seasonal with a strong focus on the winter months. • Littering • Global pandemics. • Wet and misty conditions are common, making hiking, and even driving the main access road a perilous undertaking.

	STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
	• Picturesque escarpment terrain, with spectacular views and a very scenic road bisecting the Protected Area. • The local Raydah community to the west of the Protected Area is very supportive of the Protected Area and should have a keen interest during the field trip to play a meaningful role in the development of tourism. • Historical heritage and living culture – old Ottoman castles and small-scale rural subsistence farming.		immersive cultural experiences, etc. • The 2030 Vision initiative provides opportunities to showcase all of the NCW Protected Areas to a wider audience. • Presence of archaeological/cultural sites with potential for tourism development opportunities.	
Stakeholder Relationships	• Strong government support. • Broad local support for the protected area, particularly from village and farming communities west of the PA	• Some conflict with communities, particularly around conflict with baboons.	• Train and engage the local community to guide tours of restored historical sights. • Employment opportunities for *Opuntia* control. • Employment opportunities for baboon control and management.	• The lack of potable water in Raydah village appears to be a persistent problem. Water is currently piped from the top of the escarpment down to the community, where available water is shared amongst the residents for household and agricultural needs. The pipe does not deliver sufficient water and is often damaged by baboons. • The Protected Area is home to many baboons who have become accustomed to human presence and activity. They have, therefore, become a major nuisance to visitors and residents. • Negative attitude towards wildlife induced by problem animals (Baboons).
Park Management	• Strategic Location: Proximity to Abha enhances accessibility for management, research, and potential ecotourism. • Foundational Infrastructure: The existing ranger station, nursery, and	• Difficult terrain to traverse/manage. • challenging and steep road conditions. • Human-Wildlife Conflict: Baboons create ongoing challenges, exacerbating management difficulties.	• Community Engagement: Potential to involve local communities in management through employment, education, and sustainable livelihoods, increasing support for conservation.	• Environmental Risks: Invasive species, soil erosion, and climate change pose significant threats to park management and infrastructure. • Safety Concerns: Steep, poorly maintained roads increase the risk of

	STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
	road network provide a base for future development. • Manageable Size: The small size of the Protected Area makes it easier to manage and monitor, allowing for more focused and intensive management efforts.		• Ecotourism Potential: Developing infrastructure and services could position Raydah as a key ecotourism destination, benefiting park management and local communities.	accidents for both staff and visitors, complicating management efforts.

SECTION FOUR: VISION AND TARGET OUTCOMES

4.1. STAKEHOLDER CONSULTATION OUTCOMES

The following table provides insight into the stakeholder engagements undertaken during the fieldwork.

Table 11: Community and PA Management Consultation Outcomes

SECTOR	ISSUES/SUBJECT OF DISCUSSIONS

PA Management	• The boundary of PA is not demarcated – errors on the official map?
	• Very good relations with the community, no poaching or illegal logging issues – locals take pride in PA.
	• The rugged nature of the terrain makes access difficult and protects PA from exploitation.
	• Local inhabitants use the area for recreation viz, picnics, and trails.
	• Baboons are a major threat as the PA develops – raid bins, raid houses, destroy water pipes, etc.
	• Historical values – historical Turkish Forts as well as old terrace agriculture.
	• Community liaison – 3 tribes each with a representative.
	• Active environmental education program with the local community. The school club and photographic club are active.
	• Three most important objectives:
	  ○ Find a method to improve Juniper cover and growth.
	  ○ *Opuntia* – remove and control.
	  ○ Improve tourism offerings and infrastructure – visitor control, camping, trails, environmental education, and interpretation.
	• Relations with the Raydah community are good.

Community leadership	• One community leader was interviewed, and the main points of this discussion have been captured below.
Communities and individuals	• Value the PA as it protects wild plants but sees *Opuntia* as a problem in conserving flora. • Concerns about the dieback of trees in the Juniper forests – believes it is a result of the cessation of the traditional practice of pruning. • Concerns regarding the decline of the Asir magpie. • There is no formal liaison between PA and the community, but the community is very communicative and cooperative. There is a need to formalize this relationship. • Concerned that the youth are disconnected from nature – there needs to be a greater focus on school programs involving the PA. • There appears to be a good relationship between Environmental Police, Municipality, Civil Police, and community heads. • Baboons are seen as a big problem – current efforts to control them are not effective. • Water in the valley stream appears to be more ephemeral and prone to flash flooding. Groundwater is declining. • Mountain catchment management might solve the water problem but must manage *Opuntia*. • Water is seen as a big problem for future development prospects. Many farmers emigrated out of the valley due to a lack of water. • The area has a rich cultural heritage. Historical watch towers and castles of ancestors abound – over 100 years old.

4.2. MAJOR SITE VALUES

Major site values include:

Category	Type of Value	Description
Natural Value	Intact Juniper Cloud Forest	RPA hosts Mature Juniper (*Juniperus procera*) Forest. At the time of its proclamation, the forest was considered the most intact example of juniper cloud forest in Saudi Arabia. This forest serves as a habitat for a significant number of Saudi Arabia's endemic and near-endemic plant and bird species. It is now used for conserving specific shrubs and endangered species.
	Unique Montane Habitats and microhabitats that serve as a world-class biodiversity hotspot.	RPA is the Smallest PA in the Kingdom situated within the Sarwat mountain range. The PA has one of the highest local heights (~ 3,000m above sea level) and receives the highest amount of rainfall in the Kingdom. Its unique topographic, wide altitudinal range and climatic characteristics support highly heterogenous habitats and microhabitats that are associated with varying microclimates, high rates of endemism, and great biological diversity at genetic, species, and ecosystem levels. For instance, the PA harbours 19 species of endemic birds including Asir Magpie (*Pica asirensis)* which is the rarest bird in the world that is classified as an endangered species by the IUCN Red List. Internationally, it is recognized as an important bird and biodiversity area (IBA) as it supports over 98 bird species. Available evidence suggests that over 2,000 plant species have been recorded in the southwest highlands, where the PA is found, making the highlands one of the globally important floristic richness and high endemism areas. This biodiversity-rich area equally supports a great variety of invertebrates, herpetofauna, and mammals.
	Ecosystem services and products	Being part of the mountain ranges, like other mountains, the PA provides several ecosystem services. In terms of provisioning services, the PA provides food (incl. honey), fresh water, fiber, medicinal plants, ornaments, fodder, building, and raw materials incl. timber, firewood, habitat, and genetic resources. Similarly, the PA also regulates climate and water flow in addition to purifying air quality and water. Besides, the PA controls erosion natural and hazards. Conversely, the PA also offers cultural services by presenting education, recreation, and research opportunities due to its cultural heritage, and aesthetic, spiritual, and religious values.
Economic Value	Economic opportunities	The PA presents several opportunities for socioeconomic development to the neighboring communities through tourism, beekeeping, and subsistence farming activities in Raydah village.
	Source of employment	Like other NCW's PAs, RPA through NCW has recruited several Rangers from nearby villages and offers beekeeping opportunities to community members who are interested in apiculture.

Socio-cultural Value	Cultural Value	The PA supports the traditional lifestyle of the local communities, especially those who live in Raydah village. Some of the cultural attractions found in the area include traditional culinary and coffee making, traditional farming practices, rich cultural heritage, and access to the stone forts or castles in the area.
	Aesthetic and Recreational Value	Scenic beauty – landscape, retreating escarpment - potential access via walking trails. The PA also provides opportunities for day visitor experience, mountaineers, and birdwatchers.
	Nutritional Value	RPA provides suitable habitats for conducting beekeeping activities and the production of honey that is consumed by the neighboring communities and beyond.
	Scientific Value	The PA also presents a great opportunity for local and international scientists and researchers to conduct cutting-edge research that advances science and our understanding of the natural world.
	Educational Value	The PA's proximity to Abha City enhances accessibility and a conducive environment for the provision of conservation education to scholars, non-scholar community members, and the public.
	Medicinal Value	With an astonishingly great variety of plant species, the PA also offers a high diversity of medicinal plants that prevent and cure health disorders.

4.3. PROTECTED AREA VISION, MISSION AND GOALS

4.3.1. VISION

The vision for Raydah as an IUCN Category IV Protected Area is:

"A restored, protected, resilient and sustainably used example of the ecological processes, habitats and species typical of Asir Escarpment Slope and Asir Escarpment Crest Juniper Woodland Ecosystems, which supports sustainable benefits to local and visiting communities"

4.3.2. MISSION

Restore, protect, and sustainably manage the protected area with and for the benefit of the neighboring human population first, and for the benefit of the citizens of Saudi Arabia as a whole.

4.3.3. GOALS

The following overarching goals focus attention on the requirements for meeting the vision and mission of the protected area:

1. **Biodiversity conservation** – restore, protect, and maintain biodiversity (ecosystems, species, and genetic), ecological integrity, and resilience, ensuring the survival of rare threatened, and endemic species.
2. **Sustainable resource management** – implement practices that allow for the sustainable harvesting of resources in support of long-term ecosystem health, integrity, and local livelihoods.

3. **Cultural and traditional practices** – Recognise and support the rights and traditional practices of local communities and incorporate these into conservation strategies.
4. **Research and monitoring** –
    a. Undertake scientific inventories and investigations to improve knowledge of the structure, function, and ecological dynamics of the biophysical elements of the PA.
    b. Monitor ecological change in response to management interventions and resource use to inform adaptive management.
    c. Monitor the response and attitudes of local communities to management interventions (outreach, education access, and use of resources) to inform adaptive management.
5. **Education and Awareness** –
    a. Promote education and awareness among local communities.
    b. Involve the local community in conservation and sustainable resource use programmes through capacity building and outreach.
6. **Sustainable Development** –
    a. Support sustainable development initiatives that benefit local communities and contribute to conservation goals.
    b. Promote and facilitate nature-based tourism and other sustainable economic activities that do not harm nature or the environment.
7. **Conflict Resolution** – Develop and implement mechanisms to resolve conflicts over resource use and access.
8. **Legal and Institutional** –
    a. Ensure effective governance, including clear land tenure and resource use rights.
    b. Establish and enforce a strong legal and institutional framework for the management of the protected area.

4.4. STRATEGIC OBJECTIVES AND OPERATIONAL KPIS

Strategic objectives and their target outcomes to focus on until 2030 are summarised below.

Table 12: Strategic objectives and target outcomes for Raydah PA.

NO	KEY AREA	SPECIFIC OBJECTIVES	TARGETED END STATES (2030)
1	Biodiversity Conservation	1. Prevent and control human-induced soil erosion. 2. Control the distribution and abundance of *Opuntia spp.* in the PA to a level that has minimal impact on hydrology and the structure and diversity of indigenous flora and fauna. 3. Reduce the nuisance activities of baboons emanating from the Protected Area to acceptable levels. 4. Collaborate with Soudah Cloud Forest Reserve and the Imam Faisal bin Turki Royal Reserve authorities in undertaking the re-establishment of viable populations of Nubian Ibex to the Asir Escarpment.	1.1. Man-inducing soil erosion has been identified and mapped. 1.2. Plans for erosion mitigation have been developed and are in the process of being implemented. 1.3. All new developments (e.g. trails, picnic, and camping areas are planned to minimize impact on hydrology and soil erosion. 2.1. A plan for the systematic elimination and control of *Opuntia spp.* from the PA has been developed and resourced. 2.2. At least 50% of the area of the PA where *Opuntia* occurs has been initially cleared and had one follow-up treatment. 3.1. Develop and implement a focused baboon management plan and program. 3.2. The nuisance activities both within and outside of the PA have been contained to an acceptable level. 4.1. Viable and thriving of populations Nubian Ibex have been established on the Asir escarpment.

NO	KEY AREA	SPECIFIC OBJECTIVES	TARGETED END STATES (2030)
2	Sustainable resource Use management	1. Encourage and facilitate the adoption of beekeeping along the western and eastern boundaries of the PA. 2. Encourage the safe harvest, processing, and consumption of Opuntia spp. from the PA.	1.1. Beekeeping has been adopted as a supplementary resource activity around the PA. 2.1. *Opuntia spp*. Fruit and cladodes have been adopted as important supplementary food by communities living adjacent to the PA and beyond.
3	Cultural and Traditional Practices	1. Document and preserve traditional knowledge. 2. Collaborate with local communities to incorporate traditional knowledge and practices into formal management plans and strategies where still appropriate. 3. Protect sacred sites and cultural heritage.	1.1. Traditional environmental knowledge and practices have been documented and disseminated. 2.1. Traditional and environmental knowledge and practices have been incorporated into management plans and strategies where appropriate. 3.1. Sacred sites and cultural heritage in the PA and buffer zone are protected.
4	Research and monitoring	1. Develop and maintain 'complete' annotated species lists of reptiles, amphibia, birds, and mammals through observation and survey. 2. Encourage research into the causes of dieback in *Juniperus procera*, and solutions that could improve the status and health of Juniper forests. 3. Monitor and report on the status and trend of selected red data species.	1.1. Species lists of amphibia, reptiles, birds, and mammals annotated with their IUCN Red-list Status completed and maintained. 2.1. Research on the causes of Juniper dieback has been undertaken and recommendations for managing forest health made. 3.1. The status and trend of at least 5 red data species have been monitored and reported on.
5	Education and Awareness	1. Implement environmental education amongst youth and young adults, using the protected area as the primary classroom. 2. Promote vegetation recovery, wetland restoration, soil conservation practices, and sustainable resource use in communities living adjacent to the PA.	1.1. The majority of citizens living within 10 km of the PA are aware of and appreciate its value to them and their society. 2.1. There is an improved understanding and practice of sustainable resource use methods in the communities living adjacent to the PA.
6a	Sustainable development	1. Support and facilitate the participation of local communities in the 'biodiversity economy' associated with the protected area. 2. Support the development of alternative livelihoods that reduce pressure on natural resources, such as beekeeping, handicrafts, and ecotourism. 3. Facilitate and develop nature-based tourism opportunities that provide socio-economic benefits to local communities while minimizing environmental impacts.	1.1. Local communities have been equipped with the skills and knowledge needed to engage in the biodiversity economy. 1.2. Opportunities for local community members to benefit from the biodiversity economy associated with the protected area are fully supported. 2.1. Alternative livelihood ventures have been promoted and supported. 3.1. Direct benefits from nature-based tourism to the PA and its buffer have been received by local communities.

NO	KEY AREA	SPECIFIC OBJECTIVES	TARGETED END STATES (2030)
		4. Reduce financial barriers to starting and maintaining biodiversity-based businesses.	4.1. Offer microfinance, grants, or low-interest loans to support community-based biodiversity enterprises.
6b	Visitor management and tourism development	1. Ensure all tourism development proposals are responsive to the applicable IUCN Green List Indicators. 2. Take cognizance of and be responsive to, the needs and aspirations of all stakeholders, including the local community. 3. Identify and describe appropriate target markets. 4. Identify and describe a range of appropriate tourism experiential areas that showcase the biodiversity, landscapes, and cultural historic assets of the PA. 5. Identify and describe appropriate visitor activity typologies compatible with the PA's character and its conservation values and environmental sensitivities. 6. Identify and describe appropriate tourism amenity typologies compatible with the PA's character and its conservation values and environmental sensitivities. 7. Identify and describe appropriate tourism products and tourism operational models. 8. Identify and describe appropriate visitor and tourism management guidelines, including carrying capacity and effective access control.	a. A high-level tourism development framework that will guide the tourism development and management within the PA for the next 5 years. b. Viewpoints, hides, demarcated hiking and day walk trails, and signage have been developed within the Protected Area. c. Two hiker's huts have been developed. d. A development node including 8 chalets, a camping site, a visitor center, and a day visitor's area has been developed (on the privately owned land parcel within the Protected Area). e. A day visitors area with interpretive viewpoints has been developed along the main escarpment access road (external to the Protected Area).
7	Conflict resolution	1. Ensure incisive and participatory decision-making processes that involve all relevant stakeholders including local communities. 2. Develop effective mechanisms to resolve disputes and conflicts related to resource use, land rights, and management practices within the protected area and its buffer zone. 3. Prevent or reduce the incidence of human-wildlife conflict which leads to negative perceptions of the protected area.	1.1. Relevant stakeholder management committees have been established to facilitate dialogue and shared decision-making. 2.1. Conflict resolution committees, mediation processes, and legal frameworks are in place and can adequately address grievances and disputes. 3.1. Preventative measures, deterrents, and compensation systems are in place to protect or compensate communities for losses due to human-wildlife conflict where appropriate.

NO	KEY AREA	SPECIFIC OBJECTIVES	TARGETED END STATES (2030)
8	Legal and institutional	1. Strengthen institutional capacity. 2. Enhance Enforcement mechanisms. 3. Promote participatory governance. 4. Coordinate and integrate PA management strategies with those of the Soudah Cloud Forest Reserve, the Imam Faisal bin Turki Royal Reserve, and the Aseer Development Authority.	1.1. The protected area has adequate resources, staff, and technical expertise to achieve the PA objectives. 2.1. Collaboration between enforcement agencies and local communities has been achieved. 4.1. The rights and interests of local communities are recognized and respected. 4.2. Local communities and other stakeholders are involved in the decision-making process for the protected area. 5.1 Close strategic synergies and management collaboration have been achieved between the management authorities of the Soudah Cloud Forest Reserve, the Imam Faisal bin Turki Royal Reserve, and the Aseer Development Authority.

SECTION FIVE: STRATEGY AND ROADMAP

5.1. THREAT MITIGATION AND RESTORATION INITIATIVES

Addressing and mitigating unlawful, undesirable, and incompatible activities that threaten the integrity of the Raydah Protected Area is crucial for ensuring its long-term conservation and sustainability. Mitigation strategies should be guided by global best practices in protected area management to restore ecological integrity, which is essential for rewilding and sustainable tourism.

The success of these strategies depends on the active support of surrounding communities, including neighbouring farmers, land users, and the local municipality. Building and maintaining strong relationships with these stakeholders is vital, as is the effective management of any issues or conflicts that may compromise these relationships. Educational initiatives aimed at raising awareness among local communities and stakeholders are key to fostering understanding, voluntary compliance, and effective enforcement.

Preserving Raydah's integrity is vital for ecosystem conservation, sustainable tourism, and the protection of natural resources. Cooperation with local law enforcement, including the SFES, local police, and judiciary, is essential for the successful implementation of these strategies.

The long-term sustainability of the Raydah Protected Area will rely on political will, the support of the local community, and the successful management of relationships with key stakeholders.

Table 13: MITIGATION AND RESTORATION INITIATIVES

Threat/Pressure	Actions and Mitigations Required
Overpopulation and Nuisance Impact of Baboons	- **Develop and implement a comprehensive baboon management plan**: Focus on reducing human-baboon conflicts through non-lethal control measures, habitat modification, and containment through fencing at the PA urban interface. - **Engage local communities:** Implement educational programs to increase awareness, encourage non-feeding practices, and participate actively in securing household and municipal waste. - **Monitor human/baboon conflicts**: Regular recording of the location and nature of baboon/human conflict and reporting of these incidents regularly is needed firstly to understand the distribution, nature, and socioeconomic impact of this problem and to determine the effectiveness of mitigation efforts.
Invasive Opuntia	- **Develop and implement a comprehensive invasive species management plan**: Focus on the control and gradual eradication of *Opuntia* through mechanical removal and, where feasible, biological control. - **Research and adapt global best practices**: Apply techniques proven effective in similar environments, considering the importance of *Opuntia* as an emergency food resource. - **Regular monitoring:** Conduct ongoing assessments to evaluate the success of control measures and prevent re-infestation.
Roads and New Construction	- **Conduct Environmental Impact Assessments (EIA)** For all new construction projects to identify and mitigate risks associated with landslides, erosion, and rockslides. - Stabilize slopes and improve drainage: Implement slope stabilization techniques, such as retaining walls and vegetation, and enhance drainage systems to reduce erosion. - Enforce construction best practices: Establish guidelines to minimize environmental disturbance during construction activities.

Threat/Pressure	Actions and Mitigations Required
Dangerous Steep Road	- **Improve road safety measures:** Install safety barriers, clear signage, and road markers along steep and hazardous sections of the road. - Restrict access to unsuitable vehicles: Implement a permit system for road access, limiting it to vehicles capable of safely navigating the terrain. - Develop alternative access routes: Where feasible, create safer alternative routes for both visitors and management staff.
Climate Change	- **Monitor climate impacts on key species**: Conduct ongoing research to understand the effects of climate change on juniper forests and other critical habitats. - Implement habitat restoration programs: Replant native species in areas affected by climate change, with a focus on enhancing resilience. - Collaborate with research institutions: Partner with universities and climate research centers to develop and implement adaptive management strategies.
Soil Erosion	- **Implement erosion control measures:** Use check dams, terracing, and replanting of native vegetation to prevent and mitigate soil erosion. - Improve Road drainage systems: Enhance drainage along roads to reduce water runoff and minimize soil displacement. - Regular monitoring: Conduct periodic inspections to assess the effectiveness of erosion control measures and adjust as needed.
Feral Cats	- **Implement feral cat control programs:** Use humane trapping and neutering programs to control the feral cat population. - Increase public awareness: Educate local communities and visitors about the impact of feral cats on native wildlife and encourage responsible pet ownership.
Forest Fire	- **Develop and enforce fire prevention strategies:** Establish and maintain firebreaks, clear undergrowth, and create a rapid response plan for fire incidents. - Conduct regular fire drills and training: Ensure that staff and local communities are prepared for fire emergencies through routine drills and training sessions. - Collaborate with local authorities: Work closely with local fire departments and emergency services to coordinate fire prevention and response efforts.
Road Repairs	- **Plan and execute environmentally sensitive road repairs:** Use erosion-resistant materials and techniques that minimize disturbance to surrounding vegetation during road repairs. - Limit repair activities to dry seasons: Conduct repairs during periods of low rainfall to reduce the risk of erosion and environmental damage. - Monitor repair sites: Regularly inspect repaired sections to ensure long-term stability and minimal environmental impact.
Farm Inside the Protected Area	- **Engage farmers in sustainable agriculture practices:** Promote organic farming, water conservation, and the use of native species in farming practices. - Limit agricultural expansion: Work with farmers to prevent the expansion of agricultural activities within the Protected Area's boundaries. - Monitor land use impacts: Regularly assess the impact of farming activities on the Protected Area's ecosystem and make necessary adjustments to management practices.
Litter	- **Increase waste management facilities:** Install more bins and recycling stations, especially at picnic sites and visitor areas – ensure that all temporary waste collection points are baboon-proof. - Conduct regular clean-up campaigns: Organize periodic litter clean-ups involving staff, visitors, and local communities.

Threat/Pressure	Actions and Mitigations Required
	- Educate visitors on proper waste disposal: Use signage and outreach programs to encourage responsible waste management among visitors.

5.2. ZONING AND PHASING STRATEGY

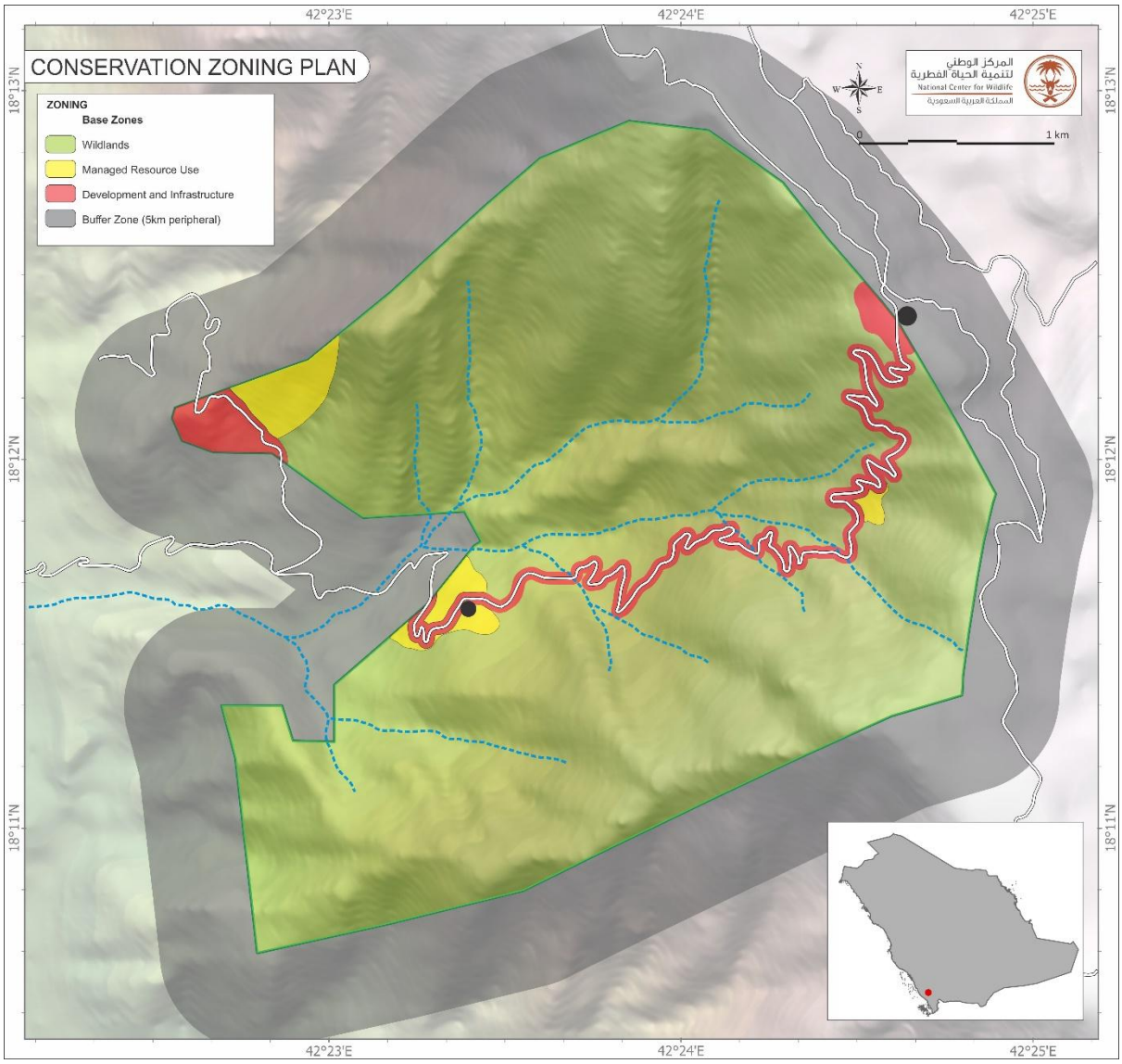
5.2.1. ZONATION

The zoning plan for the PA was developed to include a set of zonation categories that are first responsive to the IUCN categories and second responsive to the Raydah PA's natural, man-made, and cultural historic environment.

- The key information to the zoning plan includes the following:
  - Topography and gradient.
  - Areas of biodiversity importance.
  - Habitats and land cover.
  - Existing anthropogenic impacts, including infrastructural development (HQ complex, ranger stations, agricultural lands, and other deforested areas), and linear utilities such as roads and powerlines);
  - The presence of high-intensity human activity close to the protected area.
  - Existing high-value visitor areas.

The defined zoning categories are as follows (described from least intensive to most intensive use):

- **Wildlands Zone (9.2 km^2)**
  - This zone almost exclusively includes the steeper gradients and undisturbed areas of the Protected Area. It does also include areas of low biodiversity (i.e., those areas currently heavily invested in with Opuntia spp.), but it is anticipated that these areas will be restored over time to qualify for wilderness zonation.
- **Managed Resource Use Zone (0.23 km^2)**
  - The LIUZ covers areas that are moderately disturbed, are easily accessible by vehicle, and in most cases include man-made structures and utilities.
- **Development and Infrastructure Zone (0.57 km^2)**
  - The HIUZ covers areas that are heavily disturbed, are easily accessible by vehicle, and in most cases include man-made structures and utilities. Importantly, this includes an area in very close proximity to the main entrance to the Protected Area and the Protected Area HQ.
- **Buffer Zone**
  - A dedicated buffer zone is an important component of the zonation for Raydah to secure protected integrity and enable close collaboration between protected area staff and neighboring communities. Conceptually it is envisaged as a 500m buffer, but on ground hard barriers as well as natural catchment boundaries will modify its location as agreements are secured.
- **Overlay Zones:**
  - No overlay zones have been applied, but it is anticipated that resource harvesting areas will be defined as overlay zones by PA management on an annual basis. Such would typically be informed by community consultations, available herbaceous and woody biomass, and other sought-after non-forest timber products.



Map 9: Proposed zonation for Raydah PA.

5.3. OPERATIONS

The PA's operations aim to achieve its conservation vision and objectives. To meet these goals, there is a clear need for upscaling and expanding operations and enhancing operational capacity. This requirement spans various aspects of the PA's management, including law enforcement and protection, zoning, wildlife re-establishment, habitat restoration, tourism, community engagement, and research and monitoring.

Detailed planning and execution of these activities, as outlined in various supporting plans, are instrumental in guiding the PA toward achieving its conservation goals effectively and sustainably.

Details are described in each of the accompanying plans as follows:

- Law Enforcement and Ranger Patrols (Security - Area Integrity and Protection plan to be developed) (Operations Plan)
- Community outreach (Contact and Communication Plan)
- Tourism plan implementation (Visitor Management Plan)

SECTION SIX: ENABLERS AND IMPLEMENTATION PLAN

6.1. OPERATIONAL DESIGN

6.1.1. GOVERNANCE STRUCTURE

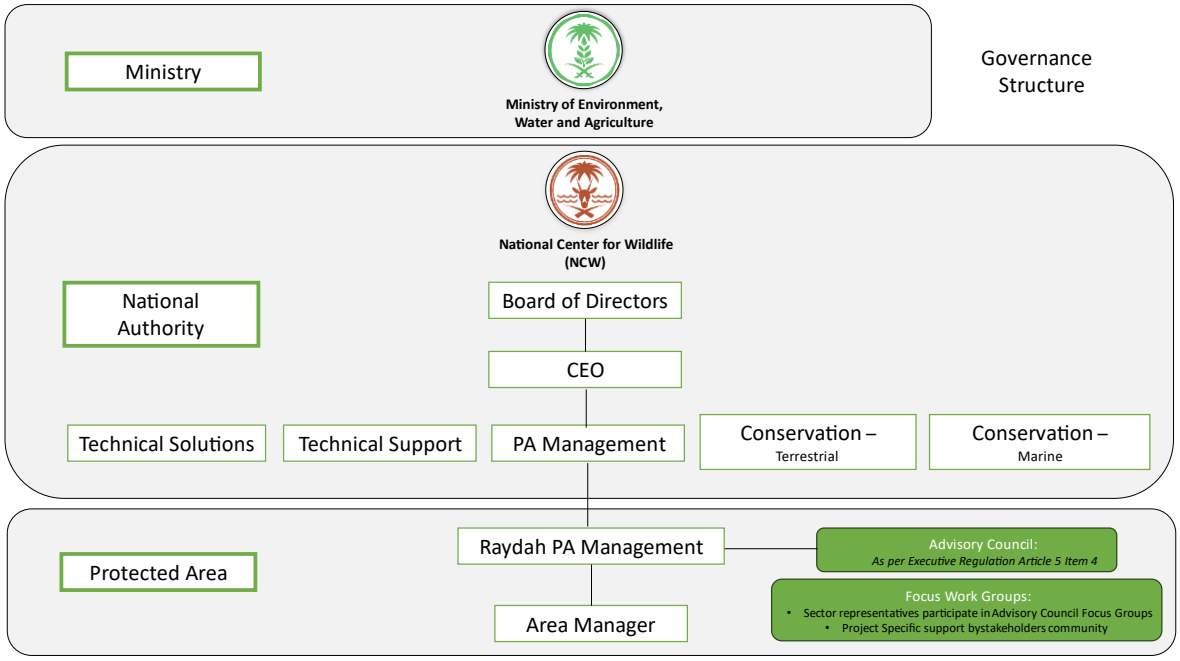


Figure 6: National Level Governance Structure

The current national-level governance structure for the Raydah PA is considered adequate. However, devolving implementation responsibilities is essential to effectively achieve the management plan's objectives. This devolution is crucial for addressing site-specific challenges and effectively implementing the plan. Centralized operations could severely hinder progress, making it necessary to develop site-level capacity to manage the PA's unique needs and challenges. The proposed departmental and organizational structure supports this site-level capacity, ensuring that the PA can function semi-autonomously within the national authority's framework.

6.1.2. ORGANIZATION

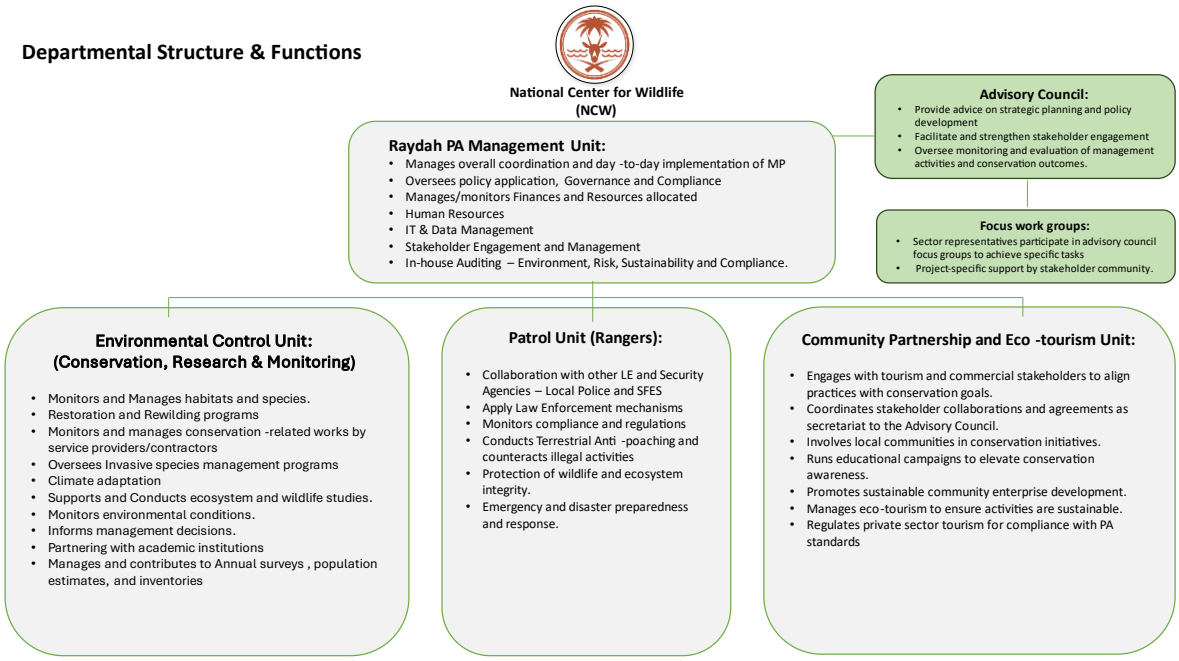


Figure 7: Proposed Departmental Structure

The staffing organizational structure proposal is tailored to align with the principles of devolution and semi-autonomy. This design aims to empower the PA to independently and effectively address its unique challenges and manage day-to-day operations. The structure is reflective of the necessary site-level capacity, allowing the PA to operate efficiently while adhering to guidance from the national authority, advisory council, and management plan.

6.1.3. PEOPLE

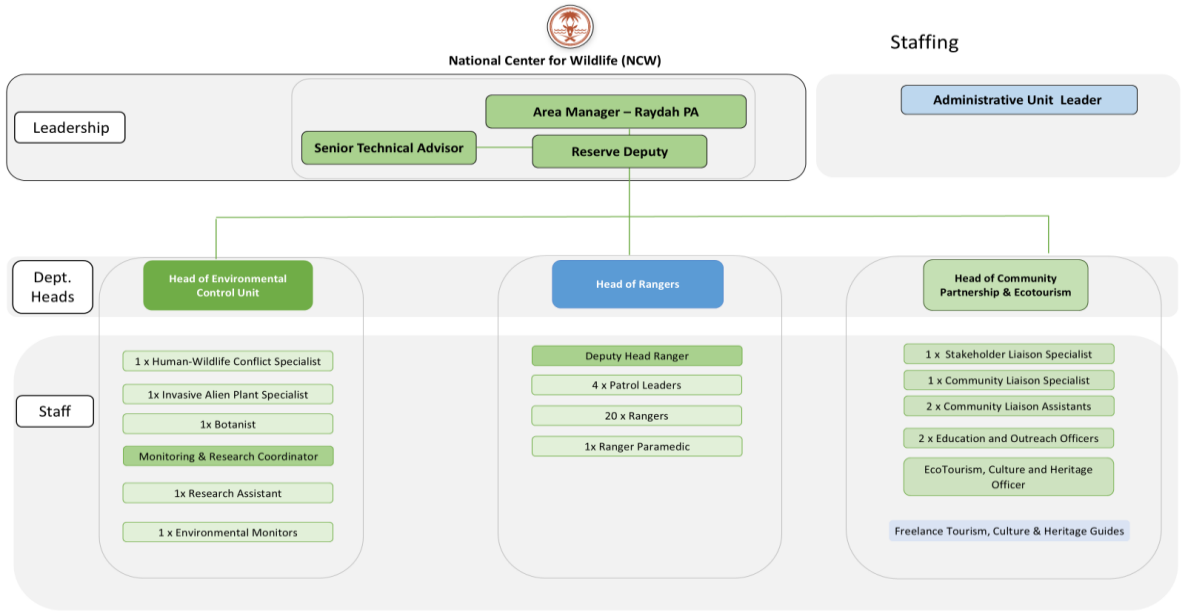


Figure 8: Staffing

6.1.4. RATIONALE: 5-YEAR PROGRESSIVE CAPACITY BUILDING AND STAFFING

One of the first steps in this expansion will be appointing heads for various departments, followed by recruiting technical advisors with hands-on experience. These advisors will play a critical role in harmonizing the different aspects of the Protected Area's operations. Ensuring that practical experience is a key criterion in the recruitment process will be vital to the successful development of the Raydah Protected Area. A Stakeholder Liaison Specialist will be crucial in facilitating communication and collaboration between the Raydah Protected Area, the larger Faisal bin Turki Royal Reserve, and the Souda Cloud Development Agency, ensuring alignment on conservation goals and strategies. This role will involve coordinating joint initiatives, managing stakeholder relationships, and ensuring consistent engagement with key partners to support integrated management efforts.

In alignment with NCW's goal to improve gender equity, the plan includes increasing female representation within the workforce, aiming for women to constitute 30% of the staff by 2030. Women in the workforce will serve as role models for other women and girls in the community, influencing future career choices and aspirations. Additionally, having women on the team will enhance the Protected Area's ability to engage with women and girls in the community, particularly in environmental education efforts.

The accompanying operations plan will detail the full staffing requirements and the progressive capacity-building strategy. It is important to note that the figures provided are indicative and based on estimates aligned with the proposed vision and objectives outlined in this document.

6.2. RISK MITIGATION APPROACH

To ensure the sustainability of the Raydah PA, including the safety of its wildlife, natural assets, and staff, it is essential to develop proactive and preventive risk mitigation strategies at all levels. This approach helps avoid the pitfalls of reactive measures, which are often costlier and less effective, as they address issues only after damage has occurred.

The Risk Mitigation Strategy aims to identify, assess, and manage risks that could impede the implementation of the Management Plan. This strategy must be integrated into both the plan and daily operations to ensure resilience and adaptability in facing uncertainties.

Key Elements of the Risk Mitigation Strategy:

- **Unified Risk Management:** Promote a consistent organizational approach through training and standardized protocols. Ensure all staff and visitors are informed of potential risks.
- **Informed Decision-Making and Resource Allocation:** Integrate risk assessments into decision-making processes and resource allocation. Establish a dedicated risk management budget and committee to oversee these efforts.
- **Strategic Foresight and Scenario-Based Planning**: Anticipate future risks through scenario-based planning and regular reviews. Develop plans and allocate resources for various potential scenarios.
- **Innovative Solutions:** Explore and implement innovative risk management approaches, such as advanced wildlife monitoring technology and habitat restoration techniques.
- **Transparency and Governance:** Foster a transparent approach to governance and communication. Engage stakeholders in risk management efforts and maintain clear communication channels.

6.3. IMPLEMENTATION STRATEGY

6.3.1. INFRASTRUCTURE DEVELOPMENT

The infrastructure adequately meets the needs of the protected area and complies with administrative requirements, although some development may still occur in the future.

Table 14: Development schedule for infrastructure.

ACTIONS	2024	2025	2026	2027	2028	2029	2030
Engage Consultant to develop a comprehensive Infrastructure Development plan, incl. detailed engineering plans to cover Road Drainage, Erosion, and Management Infrastructure.							
Initiate Erosion and Drainage Project							
Reconstruct Lower Ranger Station and Facilities							
Nursery Expansion ~1000m2							
Refurbish the existing community center with appropriate displays and conservation education materials.							
Decommissioning, demolition, and removal of obsolete and abandoned infrastructure							
Ranger Station Upgrades: Conduct necessary maintenance, repairs, and upgrades to the existing ranger station.							

6.3.2. COMMUNITY OUTREACH

In implementing the community outreach program, and coordination with relative stakeholders.

Table 15: Development schedule for community outreach.

ACTIONS	2024	2025	2026	2027	2028	2029	2030
Develop a community outreach plan							
Refurbish the existing community center with appropriate displays and conservation education materials.							
The youth Education Outreach Officer develops curriculum and implements							
The Sustainable Resource Use Outreach Officer develops curriculum and implements							

6.3.3. TOURISM DEVELOPMENT

The visitor management plan recognizes the 2030 Vision for the Kingdom and consequently projects massive growth in the local and foreign tourism market. In response to these projections, as well as the opportunities and constraints offered by the PA, several nature, adventure, and cultural-based tourism experiences have been identified as appropriate for the development of tourism within the PA.

The Protected Area is characterized by very steep slopes, deep valleys, and a small plateau area. The dramatic (and often treacherous) topography largely dictates the type and scale of tourism experiences and commensurate activities and facilities that could be appropriately applied to the Protected Area.

It is therefore proposed that the development of tourism products focuses on non-motorized eco-tourism and specialist excursions, including:

- Day walks
- Picnicking and sightseeing
- Overnight hiking trails
- Birding
- Immersive cultural historical experiences.

In support of the above activities, it is proposed that the following visitor amenities and facilities be considered:

- Picnic sites and day visitor areas
- Interpretive viewpoints
- Visitor information center and signage
- Demarcated trails (overnight and short walks)
- Camping
- Self-catering chalets.

Given the restrictive topography of the Protected Area, there are very few options for the development of such facilities. However, the old disused football pitch on a terrace immediately west of the Protected Area HQ does present a great opportunity to develop fixed infrastructure. This is a disturbed site, with vehicular access, but is a privately owned land parcel that falls within the boundaries of the Protected Area. Any development on this site would therefore require the approval of the landowner and could be structured as a private-public partnership or similar.

Other opportunities for the development of visitor facilities are available at two other small, terraced sites along the main road that traverses the Protected Area. The first of these sites, approximately 1km due south of the HQ, comprises terraced agricultural fields and is also a privately owned enclave within the Protected Area. This site is easily accessible from the main road and is well-positioned as an overnight stop for hikers. The site for the existing game scout camp, in the west of the Protected Area, is similarly suitable for the development of a hiker's huts, and perhaps even a small day visitor's picnic site.

The quaint Raydah village at the bottom of the valley presents opportunities for authentic and immersive cultural experiences. The local community here is very enthusiastic about tourism and has indicated that they would like to play a meaningful role in the development of tourism within the Protected Area. Attractions include traditional culinary and coffee making, traditional farming practices, cultural heritage, and access to the stone forts or castles in the area. It is proposed that this community be empowered to develop homestay options for visitors coupled with an authentic cultural experience. This community is furthermore very familiar with the natural environment that surrounds them and is therefore well positioned to be trained for guiding and interpretive purposes.

It is further proposed that a day visitor's picnic and viewpoint site be developed in the extreme east of the Protected Area, adjacent to the main access road that runs along the escarpment ridge. This site falls just beyond its boundary of the Protected Area and offers possibly the best panoramic views of the Protected Area, from an elevated natural terrace.

The proposed steps and schedule for achieving the required tourism developments are detailed below

Table 16: Development schedule for tourism facilities

Actions to be undertaken	2024	2025	2026	2027	2028	2029	2030
Concessions/lease agreement process undertaken with the private sector for management of all visitor activities and facilities							
Detailed designs for tourism developments drafted							
Environmental Impact Assessments undertaken.							
Viewpoints points, hides, trails, and signage developed (within the Protected Area)							
2x hiker's huts developed within the Protected Area							
Private development node (Football field node: chalets, camping, visitor center, and day visitors)							
External picnic site and viewpoints (escarpment site)							
Local guides recruited, trained, and equipped.							
Environmental education, training, and participatory programs developed							
Environmental monitoring of visitor impact on biodiversity and habitats							
Environmental monitoring and auditing of all visitor activities and facilities							
Visitor satisfaction & feedback monitoring system in place							
LACs are established and adjusted based on visitor satisfaction and environmental monitoring.							

6.3.4. INVASIVE PLANT SPECIES PROGRAM

Alien invasive plants (particularly *Opuntia*) are perceived to be a major threat to the integrity of the PA and this threat will remain for some time into the future. The focus of this program is:

- Plan an eradication and control program in tandem with the regeneration of native species.
- Train staff with the technical skills to be able to implement the plan efficiently.
- Encourage the greater use of the cladodes and fruit by neighbouring communities.

Refer also to Appendix A.7.6.2. for more detail.

Table 17: Development schedule for alien plant planning and eradication.

ACTIONS TO BE UNDERTAKEN	2024	2025	2026	2027	2028	2029	2030
Engage a consultant to develop an Opuntia eradication and control program in tandem with the regeneration of native species.							
Train management staff and equip them with the technical skills to implement an Opuntia							

ACTIONS TO BE UNDERTAKEN	2024	2025	2026	2027	2028	2029	2030
eradication and native species regeneration program.							
Implement Opuntia eradication, regeneration of native species, and management plan.							
Encourage harvesting of cladodes and fruit of Opuntia by local communities.							

6.3.5. VEGETATION RESTORATION

Apart from the dieback of Juniper due to largely unknown causes, and the widespread invasion of the PA by *Opuntia spp.*, the vegetation of the PA appears largely undisturbed. From a strategic perspective, two actions are advocated:

- Develop and implement a spatially informed vegetation restoration plan for areas being cleared of *Opuntia* and

Table 18: Actions and implementation timelines for vegetation restoration.

ACTIONS	2024	2025	2026	2027	2028	2029	2030
Develop a spatially informed vegetation restoration plan for the PA.							
Implement vegetation restoration as per the plan.							
Partner with appropriate academic institutions and implement a focused experimental approach to Juniper forest and woodland restoration							

6.3.6. WASTE MANAGEMENT

Waste management requires the following steps:

- Engage with a waste management and disposal group to identify and quantify all waste streams and waste types within the PA (including rating the potential for reduction or recycling) then prepare a detailed waste management plan.
- Develop and implement a waste reduction strategy and targets.
- Outline the expected structure and content of a typical tourism establishment waste management plan.
- Formalize waste management agreements with municipalities and neighboring villages.
- Prepare waste management plan for NCW-operated tourism facilities.
- Prepare and implement a waste education and awareness strategy.

Table 19: Waste Management

ACTIONS TO BE UNDERTAKEN	2024	2025	2026	2027	2028	2029	2030
Engage waste management company to quantify waste streams and prepare waste disposal plan.							

ACTIONS TO BE UNDERTAKEN	2024	2025	2026	2027	2028	2029	2030
Implement a waste disposal plan.							
Formalize waste management agreements with municipalities and neighboring villages.							
Prepare a waste management plan for NCW-operated tourism facilities and implement it.							
As part of the outreach programme assists neighboring communities in developing waste awareness and disposal strategies.							

6.3.7. CLIMATE CHANGE MITIGATION AND ADAPTATION

Climate change is expected to have significant impacts on central Saudi Arabia including increased temperatures and evaporative demand, reduced precipitation (overall decrease in mean annual rainfall), and increased drought frequency. It is not clear as to the actual impacts this will have on biodiversity yet. From a protected area perspective other than regulating carbon dioxide emissions few actions can be implemented that will affect global change. At a protected area level, the following strategy roadmap is advocated:

- Keep CO_2 emissions to the minimum based on the essential use of fossil fuels.
- Maximize the use of solar and wind as an energy source in buildings and transport.
- Reduce utilization stress (grazing and browsing) on plants to compensate for increased climate-induced stress.
- Reduce increased runoff caused by poorly aligned road networks and poor drainage.
- Assess the potential impacts of climate change on the protected area and its biodiversity and monitor changes based on likely impacts (Climate change impact assessment).
- Provide training to local communities to create adaptive capacity and develop coping strategies.

Table 20: Development schedule for climate change and mitigation.

ACTIONS TO BE UNDERTAKEN	2024	2025	2026	2027	2028	2029	2030
Audit CO_2 emissions and set and implement targets to minimize them.							
Incorporate renewable energy generation and storage into all new building construction.							
Design road network to minimize water runoff and capture by poorly aligned roads and tracks							
Assess the potential impacts of climate change and monitor changes based on likely impacts.							

6.4 MONITORING APPROACH

Monitoring, evaluating, and reporting the implementation of the management plan and the outcomes of protected area management activities is critical in the day-to-day management of a protected area. Monitoring and evaluation form the basis of the adaptive management and learning cycle.

- Monitoring, evaluation, and reporting enable the objective assessment of the outcomes of management interventions and, if necessary, their modification to achieve the vision and objectives of the protected area.
- Monitoring should be designed and implemented to determine the effectiveness of the implementation of the protected areas management plan and as such should be designed to be straightforward and practical for implementation by on-site staff.
- Records of key management interventions should be maintained, as set out in the management plan.
- Scientific monitoring programs may be established to monitor specific management interventions such as those that relate to the need to understand vegetation biomass and composition change, species diversity changes, wildlife population performance and trend, and specific measures required for individual species.
- The outcomes of the monitoring process must be captured in an appropriate report linked to the management cycle. The results should then be used to inform the plan of operation that is developed for the discipline in the following management cycle or iteration.
- Transparency in communicating outcomes must be instituted as part of the monitoring, evaluation, and reporting process to ensure that the protected area maintains legitimacy regarding the activities and developments undertaken within it.
- A critical component of any monitoring endeavor is the storage and safekeeping of the results. Data management is commonly documented in a data management plan. (Soler, 2016) provides a valuable introduction to data management, and an essential starting point for developing a deeper understanding of monitoring biodiversity in protected areas (Dalton, 2024).

The basic monitoring requirements per domain are presented below.

Table 21: Basic monitoring requirements per domain

DOMAIN	MONITORING REQUIREMENTS
Biodiversity Conservation	• Climate monitoring – at least 1 automatic weather station at the headquarters and 1 manual rain gauge read daily situated at the west ranger station. • Area (in ha) initially cleared, and follow-up cleared of *Opuntia* (annual). • Area (in ha) of pa restored/planted to indigenous vegetation (annual). • Population status of threatened bird and mammal populations (annual). • Habitat conditions and threats. • Vegetation abundance and diversity.
Visitor Mgt. & Tourism	• Visitor numbers with information on the date of visit, entrance point used, and provenance (local, GCC, international) • Visitor satisfaction.
Community Engagement;	• Number of community groups/members registered. • Number of meetings conducted, and programs executed. • Number of jobs filled by local people (annually) • Monetary amount in beneficiation through local service contracts and supplies (annually) • Number of active resource management committees or cooperations
Park Management	• Monthly inspections of park infrastructure to identify and address maintenance needs • Quarterly reviews of resource allocation and utility usage • Regular compliance and enforcement audits covering health and safety, environmental, risk, and law enforcement to ensure policies are being followed • Annual protected area management effectiveness assessment (Stolton, 2007)

DOMAIN	MONITORING REQUIREMENTS
	• Five elements for effective PA Management (Planning, Input, Process, Output, and Outcomes) according to METT4/IMET (Stolton, 2007).
Sustainability (Waste, energy, climate change, pollution control	• Measurement of water use at each of the sites where amenities are provided • Bi-annual environmental audit • Compliance with a waste management plan