

## Chapter - 02

### BACKGROUND INFORMATION AND ATTRIBUTES

#### 2.1 Boundaries:

The National Park and Sanctuary are finally notified as such, and comprises legally constituted Reserve Forests, Protected Forests and Revenue Areas; from which all rights have been extinguished. There is no boundary dispute and the National Park and Sanctuary are clearly demarcated on map and on the ground with cement concrete pillars, masonry pillars and cut and cleared boundary lines of Reserve and Protected Forests. The detail of boundary description is given in **Annexure No. – 13**

#### 2.2 Geology rock and Soil

##### 2.2.1 Geology and Rock:

The main Geological formation found in Pench Tiger Reserve are as under:-

**Table No. - 02**  
**Geological Formation of PTR**

S.No.	Geological Time Scale	Geological Formation
1.	Recent	Alluvium
2.	Pleistocene/Recent	Laterite
3.	Cretaceous/Eocene	Deccan trap with inter-trappean beds & lametas
4.	Archean	Metamorphic and crystalline complex.

##### 1. Archean:

Archean rocks were formed during the very early period when there was no life on the earth. They are mostly of igneous origin, comprising metamorphosed granitic and basaltic rocks together with a subordinate amount of sediments. They consist of greenstone, amphibolites, amphibole schists, granitiferous, micaceous and other schists, granodiorites, gneisses and granites etc. These rocks form the basement of all other formation, so they are referred as **BASEMENT COMPLEX OR FUNDAMENTAL GNEISS**.

Archean rocks are found in most parts of the Park and Sanctuary. Lithologically they are of "Pre-Cambrian" age. These rocks are further sub divided in to:

##### A. *The rock of Saunsar Series:-*

The oldest exposed rocks occur in the form of a linear belt well exposed on National Highway No. 7. This group of rock comprise of a series of schists, gneisses, marbles and calc-gneisses, granulites, conglomerates, dolomitic marbles and other sedimentary and igneous metamorphic rocks. These are associated with granites and ortho and composite gneisses. Granites and amphibolited pegmatite and quartzite later intrude these rocks.

## ***B. Granites and Granite series:-***

This group comprises of granites, gneisses, crystalline schists, intrusive pegmatites, quartz veins and other acid and basic intrusive. Texture of gneiss varies from holocrystalline muscovite rock to almost felsites with so fine a texture that it appears homogeneous to naked eyes.

## **2. Deccan trap and associated sedimentary rocks:-**

Deccan trap is basaltic flow, which is one of the extrusive igneous rocks widely distributed in Seoni and Chhindwara, is found only in some portion of Dudhgaon, Thuyepani area in National Park. These rocks are often associated with infra-trappeans and inter-trappeans sedimentaries.

### ***A. Deccan – Trap: -***

Deccan trap are mostly basaltic in nature and comprises of various flows. These are generally dark black in colour and fine to medium grained. The flows are hard, compact and massive in nature, with or without vesicles and amygdules. Amygdules are some time filled with beautiful crystals of variety of quartz. Jointing and columnar jointing is quite common in Deccan traps. Physiographically the Deccan traps occupy the higher elevation and forms broad levelled grounds with occasional conical hills.

The trap country is characterised by flat-topped hills and step like terraces. This topography is a result of the variation in hardness of the different flows and of parts of the different flows, the hard portions forming the tops of the terraces and plateau. In the amygdular flows the top is usually highly vesicular, the middle fairly compact and the bottom showing cylindrical pipes filled with secondary minerals, while in the ordinary flows, the top is fine grained and the lower portion coarser with a concentration of basic minerals like pyroxene and olivine. Vascular and non-vascular flow may be alternate with each other or the flows may be separated by the beds of volcanic ash or a coriac and by lacustrine sediments known as inter – trappean beds.

### **Alternating and weathering of the traps:-**

The trap weathers with characteristic spherical ex-foliation which gives rise to large rounded boulders on the outcrops. The weathering starts along the well-developed joints, first rounding off the angles and corners and then producing thin concentric shells or layers which become soft and fall-off gradually. The interiors of the spheroidal masses are however, quite fresh.

## ***B. Infra-trappean rocks***

Infra trappean Rocks are exposed at the base of deccan trap and comprise of calcareous sand stone, pebble beds, marls and impure limestones. Occasionally a few ill-preserved fossils may be present in these rocks. Infra-trappean rocks found in this area are Lameta, which are fluvial or estuarine beds occurring below the traps at about the same horizon or slightly above that of Bagh beds of Narmada valley. They are found to rest on various older formations such as the Archeans, the Upper

Gondwanas or the Bagh beds. The chief rock types found in them are limestone, with sub-ordinate sandstones and clays. In this area Lametas are found between the trap base and gneissese rocks. They are thin and generally crop out along the base of the trap scarps. Usually thickness is 1 mt. They are calcareous sandstone, conglomerates, grits and felspathic grits derived from the denudation of underlying gneiss and granites.

### ***C. Inter-Trappean beds:-***

Inter – trappean beds are found in form of thin limestone, sandstone and shales & converted chert beds. They separates two basaltic flows from each other and are comprised of cherts, cherty limestones and impure clay bonds. These rocks also contains at times few well preserved plant and animal fossils.

### **3. Laterite:-**

Laterite is a product of tropical alteration suffered by some rocks. It is porous, pitted, clay like rock with red, yellow, brown, grey and mottled colours. It has a hard protective limonitic crust on the exposed surface, which is generally irregular and rough. When dug up, the fresh material is comparatively soft and easily cut by a spade or a saw. When the fresh soft rock is exposed to air it is quickly dehydrated and become quite hard.

Laterite is composed mainly of hydrated oxide of iron and alumina together with those of certain elements which form the group of hydrolystate such as manganese, titanium, V-anadium, zirconium etc. The silica along with magnesia, alumina etc. contained in the original rock are removed of the elements present, laterite may be called ferruginous, aluminous and magniferous. In general ferruginous laterite is red to red-brown in colour, the aluminous one grey cream, and magniferous one dark brown to black.

Laterite may be derived from alkali rock like nepheline-syenite, trachyte; intermediate and basic igneous rocks like dolerites and basalts; gneissic rocks rich in feldspars and sedimentary rocks including shales and impure limestones

### ***High level and low level laterite:-***

All the more important occurrence of laterite form massive beds which generally are found capping hills on the Deccan trap country. Laterite also occurs in the plains and at the base of the hills, these being in most cases, of secondary origin, derived from the high level laterite and recemented after deposition in the valleys or plains.

### **2.2.2 Geological mapping of the PENCH TIGER RESERVE**

As per the Geology map prepared by Geological Survey of India, PENCH TIGER RESERVE, SEONI (INCLUDING BUFFER AREA) HAS NINE DIFFERENT GEOLOGICAL ZONES,

The % area of different zone is as below :-

1.	Gnesses	72.54%
2.	Basalt	20.73%
3.	Chorbaoli formation	1.82%
4.	Lameta formation	1.7%
5.	Pench River	1.4%
6.	Lohangi formation	0.82%
7.	Laterite	0.7%
8.	Manganese	0.17%
9.	Amphibolites	0.12%

### 2.2.3 Soils:

Soil is the most precious natural resource of an area. The entire floral and faunal diversity of the area depends upon the soil. Soil is derived from underlying parental rock by means of weathering due to many natural agents like rainfall, temperature, wind and runoff. It is most important abiotic component of natural ecosystem, which is intermediary in the bio-geo-chemical cycle.

Soil of Pench can be divided on following basis

#### 1. Parent Material:

- A. Regur or Black Cotton Soil
- B. Lateritic Soil
- C. Sandy Soil
- D. Kankar and saline Soil
- E. Alluvial Soil

#### A. Regur or Black Cotton Soil :

The traps give rise to either a deep brown to rich red soil or to Regur (black cotton soil). Regur is rich in plant nutrients such as lime, magnesia, iron and alkalies on which cotton and certain dry crops flourish. It has the property of swelling greatly and becoming very sticky when wetted by rain. On drying, it contracts again with the production of numerous cracks.

#### B. Lateritic Soil :

Another product of weathering of trap is laterite, a material from which silica, alkalies and alkaline earths have been leached away, leaving behind alumina, iron, manganese and titanium. It has a vermicular or pisolitic structures and contains much water. Some laterites which are highly aluminous form deposits of bauxite. The trap scraps is the vital factor in the drainage of the area acting as watershed.

### C. Sandy Soil :

Most of the area of Core Zone is covered with sandy loame soil. The soil is the result of weathering of granitic gneisses. This soil type mostly occurs on gentle slope and valleys.

### D. Kankar and Saline Soil :

This soil type is found in the foothills in areas with less tree cover and forest gaps. They contain large proportion of silica and orthoclase quartz and have low water holding capacity. They are generally mineral deficient and have low productivity. They are easily eroded under insufficient vegetation cover.

### E. Alluvial Soil :

Alluvial soils do not really form a definite group. They represent both transported and residual soils, which may have been re-worked to some extent by water. Most of the alluvial soils are found in valleys & nala beds.

Under the influence of water, wind, rains and heat, the rocks are broken up in fine particles and carried down stream through various rivers & nalas and are subsequently deposited in the valleys, forming superficial layers. These formations carry with them the characteristic of the underlying rocks. Recent alluvial deposits are found along the Pench river and small streams of the tract. Typical examples are area along Pench, Boda nala etc.

## 2. Taxonomical Classification:

The soil of the Pench Tiger Reserve can be divided in to following category on the basis of origin, composition and physical & chemical properties.

**Table No. - 03**  
**Taxonomical Classification of Soil of PTR**

S. No.	Order	Sub Order	Great Group	Sub Group	Family
1	Entisol	Orthents	Ustorthents	Lithic Ustorthents	Lomy mixed isohyperthermic Lithic Ustorthents
					Clayey, mixed, hyperthermic Lithic Ustorthents
				Typic Ustorthents	Loamy, mixed hyperthermic Typic Ustorthents
					Loamy kaolinitic, hyperthermic, Typic Ustorthents
2	Inceptisol	Ochrepts	Ustochrepts	TypicUstochrepts	Clayey, mixed, hyperthermic TypicUstochrepts
					Fine loamy, kaolinitic hyperthermic TypicUstochrepts

					Loamy kaolinitic hyperthermic TypicUstochrepts
					Loamy, mixed, hyperthermic TypicUstochrepts
				Vertic Ustochrepts	Fine montmorillonitic, Hyperthermic Vertic Ustochrepts
S. No.	Order	Sub Order	Great Group	Sub Group	Family
		Tropepts	Ustrophepts		Fine mixed hyperthermic Vertic Ustochrepts
				Lithic Ustrophepts	Lomy mixed isohyperthermic Lithic Ustrophepts
					Loamy kaolinitic, isohyperthermic, Lithic Ustrophepts
				Typic Ustrophepts	Fine montmorillonitic,(Cal) isohyperthermic Typic Ustrophepts
					Loamy skeltal, kaolinitic, isohyperthermic Typic Ustrophepts
					Loamy kaolinitic, isohyperthermic Typic Ustrophepts
					Fine mixed isohyperthermic Typic Ustrophepts
3	Vertisol	Usterts	Haplusterts	Typic Haplusterts	Fine montmorillonitic, Hyperthermic Typic Haplusterts
					Fine montmorillonitic,(Cal) isohyperthermic Typic Haplusterts
					Fine mixed isohyperthermic Typic Haplusterts

A detail soil survey for Madhya Pradesh was done by National Bureau of Soil Survey (NBSS) Nagpur. As per the report "Soils of Madhya Pradesh for Optimising Land Use", prepared by National Bureau of Soil Survey (NBSS) Nagpur in the year 1996, Madhya Pradesh has 851 Soil Map units. Each map unit represents the association of two soil families with or without inclusions. Each association has one dominant and another subdominant soil families. The dominant soil family covers 50 % or more area while the sub dominant occupies less then 50% area but more than 20 %. The left out area if any (less than 20%) is covered by inclusion. According the report Pench Tiger Reserve has 10 map units; the detail description of each unit is given below, the code for each unit is given in parenthesis.

1. **Loamy, mixed isohyperthermic, Lithic Ustorthents, & Loamy, mixed, isohyperthermic, Lithic Ustrophepts (6):**

Extremely shallow, somewhat excessively drained, loamy soil on steep slopping hills and will range with severe erosion and moderately stony, associated with shallow, somewhat excessively drained with loamy soil on steeply slopping with severe erosion and strongly stony. This type of soil is found in 14.21% of PTR.

**2. Fine, montmorillonitic, hyperthermic, Typic Haplusterts, & Loamy, mixed, hyperthermic, Typic Ustochrepts (48):**

Deep. Moderately well drained, clayey soils on gently sloping undulating plateau with mounds, with slight erosion, associated with: shallow, well drained, loamy soils on gently sloping with moderate erosion and slightly stony. This type of soil is found in 1.0% of PTR.

**3. Loamy mixed hyperthermic, Typic Ustorthents & Clayey, mixed hyperthermic, Lithic Ustorthents (50):**

Very shallow, somewhat excessively drained, loamy soils on gently sloping undulating plateau with mounds and severe erosion, associated with, very shallow, well drained, clayey soils on moderately sloping with moderate erosion. This type of soil is found in 29.82% of PTR.

**4. Fine, montmorillonitic, hyperthermic Vertic Ustochrepts & Clayey, mixed hyperthermic, Typic Ustochrepts (79):**

Deep moderately well drained, clayey soils on gently sloping plain land with moderate erosion, associated with: Shallow, well drained clayey soils on gently sloping with severe erosion. This type of soil is found in 10.62% of PTR.

**5. Fine, montmorillonitic, (Cal) isohyperthermic, Typic Ustropepts & Fine, montmorillonitic, (Cal), isohyperthermic, Typic Haplusterts (83):**

Deep, moderately well drained, calcareous, clayey soils on gently sloping plainland with narrow valleys with severe erosion, associated with: Deep, moderately well drained, calcareous, clayey soils on very gently sloping with slight erosion. This type of soil is found in 0.00013% of PTR

**6. Loamy skeletal, kaolinitic, isohyperthermic, Typic Ustropepts & Loamy kaolinitic, isohyperthermic, Lithic Ustropepts (91):**

Shallow, somewhat excessively drained, loamy - skeletal soils on moderately sloping hills and hill ranges with severe erosion and slightly stony, associated with: Shallow, somewhat excessively drained, loamy soils on moderately sloping with severe erosion and slightly stony. This type of soil of found in 17.40% of PTR.

**7. Loamy, kaolinitic, isohyperthermic, Typic Ustropepts & Loamy kaolinitic, isohyperthermic, Lithic Ustropepts (107):**

Shallow well drained, loamy soils on moderately sloping beds (slightly dissected) with moderate erosion, associated with: Shallow, well drained loamy soils on gently sloping with moderate erosion. This type of soil is found in 7.81% of PTR.

**8. Fine mixed isohyperthermic, Typic Haplusterts & Fine, mixed, isohyperthermic, Typic Ustropepts (108):**

Deep moderately well drained, clayey soils on very gently sloping beds (moderately dissected) with moderate erosion associated with: Slightly deep, well drained, loamy soils on moderately sloping with severe erosion. This type of soil is found in 0.608% of PTR.

**9. Fine loamy, kaolinitic hyperthermic, Typic Ustochrepts & Fine, mixed, hyperthermic, Vertic Ustochrepts (113):**

Slightly deep, well drained, loamy soils on moderately sloping undulating lands with valleys with severe erosion associated with: Deep, moderately well drained clayey soils on very gently sloping with moderate erosion. This type of soil is found in 6.96% of PTR.

**10. Loamy kaolinitic, hyperthermic, Typic Ustortherns & Loamy kaolinitic hyperthermic Typic Ustochrepts (137):**

Soils of undulating to rolling lands, very shallow well drained loamy soil on gently sloping undulating to rolling lands, very shallow well drained loamy soil on gently sloping undulating rolling lands with severe erosion, associated with: shallow, well drained loamy soil on gently sloping with moderate erosion. This type of soil is found in 10.129% of PTR.

Pench River occupies 1.4% of PTR (10)

### **2.3 Physiography**

The PTR is located in the southern lower ridges reaches of the Satpura hill ranges. The folding and upheavals in the past resulted in formation of a series of hills and valleys, rendering the terrain highly undulating with most of the area covered by small hill ranges steeply sloping on the sides. Jutting out of the general undulating ground are many prominent hills, some rising over 600 M. above M.S.L. The Sanctuary area is mostly hilly with valleys and some undulating plain at the base of the hills. The Karmajhiri rang of the park is mostly undulating with some prominent hills like Arjalmatta, Kariapahar, Chhindimatta, Kumbhadeo and Khairban- matta. These hills have almost flat, gently sloping top and steep sides.

In Gumtara range the land from river Pench gradually raises towards west, forming a plateau between Jamtara, Naharjhir and Gumtara villages. After gradually slopping down towards Gumtara, the land again rises in the West-South direction forming a series of undulating hills upto Pulpuldoh, which slope down towards the river Pench on the eastern side, from Pulpuldoh upto Totladoh. Most of the low lying lands on either side of river Pench have come under submergence area of the Pench Hydroelectric project.



### **2.3.1 Geomorphology:-**

The visual interpretation of the Satellite imageries of the area, shot by LISS - III reveals that the following geomorphic units that constitute the geomorphology of the area. These units are denudational Hills, Insel- bergs Pediments, Buried pediments Alluvial plains and Plateaus.

A Brief description of the different units is as following –

#### **(I) Denudational Form**

##### **(A) Denudational Hill:**

These are the long continuous or isolated hills, showing weathered residue of the parent rock. Different trends can be found on top of the hills. These are basically located in the Southeast portion of the PTR and composed of granite and gneiss. They can rise abruptly from the pediment. The erosion is also prominent on these hilltops.

##### **(B) Plateau:**

Plateau is an extensive upland region at high elevation with respect to its surroundings. These are vastly spread on the North -West and Western part of the PTR. The Deccan Trap Complex (plateau) is made up of Basalt showing weathering followed by high erosion. The forms in the trap are observed like, Mesa and Butte. Some part of the trap is also lying in the North and North - West direction in PTR.

##### **(C) Mesa:**

A flat- topped steep sided upland. They are larger than Butte in size and have been observed mostly in the basaltic terrain of West and North - West portion of PTR.

##### **(D) Butte: -**

A steep side and flat top hill formed by erosion of flat lying strata where remnants of a resistant layer protect softer rocks underneath. The Butte has been observed in the basaltic terrain. These forms are basically smaller than Mesa in size.

##### **(E) Pediment:**

The Pediments are the indication of semi-arid climate. During their formation debris of varying size accumulates on them. The Pediments diverge from the point where the profile is convex.

##### **(F) Buried Pediments:**

The occurrence of Pediments and Buried Pediments at different levels in the same area reflects the change in slope, local base level with thick regality soil or alluvium soil. They are a result of numerous rills and sheet floods. They are fertile part and expression of denudational hills with extensive cultivation. This occurrence is found between alluvial plains and pediment.

**(G) Water Divide:**

Water divides act as a firebreak in any region. They are the margins, which forms the catchment of macro and micro watersheds of the area. Eleven major and minor water divides have been observed in the PTR, which in fact govern the water carrying capacity with other parameters like geology, soil, climate and drainage.

**(H) Dissected valley Slope:**

This unit has been observed as vast extensive unit in the PTR. Which is distributed all around the plateau and denudational hills. This zone is maximum subjected to rill and gully erosion. This terrain is more undulating with sparse rocky exposure. This is highly dissected with dendrite pattern. In some area some old debris slides or removal of blocks are also noticed.

**(I) Inselbergs:**

These are also isolated denudation ridges, which stand above the surrounding plains. These projections are rather abrupt. These may be conical or dome shaped. The rocks in these forms are of same type.

**(II) Fluvial Forms**

**(A) Alluvial Plain:**

These are gentler in slope almost flat with river borne sediments. They are either found on riverbanks or restricted within two large drainages. They show the extensive cultivation on them. The soil type found on these landforms is sand, silt and clay. The river in summer is comparatively sluggish and channel depth is not much and as a result of sand bar the boulder bed has been deposited and exposed near the bank. Few Channel Islands have also been observed within the river.

**(B) Erosion Features:**

Erosion is a term, which is used to denote geological agencies of movement, which remove rock debris and associated materials. The erosion agencies are of various types of which running water is the predominant. In the PTR most of the genesis is subjected to sheet erosion, rill erosion and gully erosion.

**(C) Sheet Erosion:**

When water just removes the topsoil from the pediment slopes, this results in the irregular patches of country rock. This is a major process in the denudation of the land surfaces.

**(D) Rill Erosion:**

These are observed basically on water when sheet erosion merges into network of rills. This erosion is confined to particular hilltops.

### (E) Gully Erosion:

Next to rills are the gullies. These have a tendency to have close network and drainage lines. This occurs because of the thinning of vegetation cover, climatic change and other man-made intervention. The head - ward erosion may also reconsider within it.

**Table No. - 04**  
**Area of Geomorphic units in PTR**

<b>Geomorphic Units</b>	<b>Area in Sq.Km.</b>	<b>Percentage</b>
Buried Pediment	35.110	4.63
Broken Ground or Bed land	1.240	0.16
Reservoir	30.440	4.02
Shallow water zone	17.420	2.30
denudational Hill	37.120	4.90
Water body/Lake/Pond	1.570	0.21
Sand near river bed	1.180	0.16
Islands within river	0.090	0.01
Plateau/Mesa	10.130	1.34
River	3.000	0.40
Dissected valley slope	377.387	49.79
Denudation hill within reservoir	0.750	0.10
Mesa	1.820	0.24
Bute	0.210	0.03
Inselbergs	0.480	0.06
Alluvial Plains	28.160	3.72
Pediments	172.830	22.80
Plateau	38.150	5.03
Boulder Bed	0.810	0.11
Total	<b>757.890</b>	<b>100.00</b>

### 2.3.2 Slopes:

The slope categories in Pench Tiger Reserve have been identified into three classes viz. (0-11 degrees, 12-22 degrees, and 23-34 degrees). Most of the PA falls into flat to gentle slope (0-22 degrees) class. The western most part of the reserved forests has a highly rugged terrain with steeper slopes (23-34 degrees).

## 2.4 Climate

### 2.4.1 Season:

The PTR lies with in the Tropical Zone, having three well & one less distinct (post monsoon) seasons. Due to great variation in temperature, humidity and precipitation in different seasons, these factors serve as regulators of vegetation and habitat of wild animals.

(A) **Summer season: -**

The summer season set in the month of March and last till around mid June, when the area receives first showers of monsoon. The last fortnight of May is the hottest, and the mercury may shoot up to 45<sup>0</sup>C. As compared to the low-lying plains outside the park and sanctuary area, the hilly tract of the park and Sanctuary experiences a milder summer. The summer season is usually dry but instances of rains, hailstorms and thunder do occur in the month of March and April. The relative humidity in the early afternoon is as low as 15-20%. The forests, which have been shedding their leaves, now wear a bleak look. The forest floor remains covered with dry grasses and fallen leaves. The water level in the area drops drastically, and by the mid of April most of natural water sources vanish. Except for a few perennial springs, artificially created water tanks, water can be seen only in few area of the riverbed of Pench river, in the shape of small water reservoirs locally called as 'Kassa' or 'Doh'. Summer fires play havoc as the dry tall grass and fallen leaves work as ready fuel. Man-made ground fires are common in this time of the year, and high temperature poses many problems in fire fighting operation. Such man-made fires usually originates from the peripheral area close to Park and Sanctuary, as the local people clear the ground by the fire to collect mahua flowers, or set fire to induce new flesh of tendu leaves from the root suckers. At times, wanton fires occur to divert the attention of staff, when the miscreants sneak in to collect fallen antlers or honey. Some time fire is caused by local people to take revenge against the authority for preventing their domestic cattle to enter in the PA or preventing the fisherman to enter in water bodies for fishing. However, vigilant and intensive fire protection measures prevent extensive fires as evident from the table below –

**Table No. - 05**  
**Fire Cases in Core Area of PTR**

<b>Year</b>	<b>No of incidents</b>	<b>Area Burnt (ha.)</b>	<b>% of Area Burnt</b>
2001	0	0	0.000
2002	1	4	0.001
2003	0	0	0.000
2004	1	2	0.000
2005	9	102	0.025
2006	3	4.5	0.001
2007	7	19	0.005
2008	-	-	-
2009	6	38.9	0.009
2010	4	36	0.009
2011	-	-	-
2012	3	21.7	0.005

Wild animal sighting during this period increases manifold in some area, as they become more mobile so as to cover large areas in search of food and water. Large herds congregate along the Pench river, especially in the draw down area of Mahadev ghat, Alikatta, Golpahari, Sapat, Chindimatta, Piyorthari, Palaspani, Umarighat and Chhindewani, where food and water is readily available.

During summer, dry riverbed allows migration of animals from both sides of the river.

**(B) Rainy season: -**

The advent of rainy season starts with pre-monsoon showers usually received in the second or third week of June, and regular onset takes place by the first week of July. The wettest months are July and August, when around 80% of the total annual rainfall is received in the season, which is around 1200 mm. The onset of rains transforms the entire Pench landscape very quickly, and the forests and meadows are restored to their previous lush-green condition. This phenomenon results in the congregation of large herds of wild ungulates in the meadows. The congregations of wild animals near water sources gradually disintegrate and disperse into the inner reaches of the forests, as food and water become plentiful everywhere. The rainy season in Pench is from the second week of June to almost middle of September.

In general the rainy season is the season of respite, but sometimes, heavy rainfall creates other management problems such as serious damage to roads, bunds, anicuts, tanks, dykes and building.

**(C) The Post monsoon season –**

This season, although, not so distinct in the meteorological sense, is distinct from wildlife management point of view. This is a season, which commences when monsoon culminate i.e. from mid September to October. This post monsoon period provides food, water and shelter in abundance. The grasses, seedlings and saplings remain green and palatable; water is available in stream, Nalas, natural depressions in almost every part of the National Park and Sanctuary. This is a period during which most ungulates litter and the wilderness experiences sudden growth in a population in the lower forms of life. Therefore, this is season of abundance, which follows the period of respite (rainy season) and then gradually passes into a period of scarcity especially for herbivores.

**(D) The winter season –**

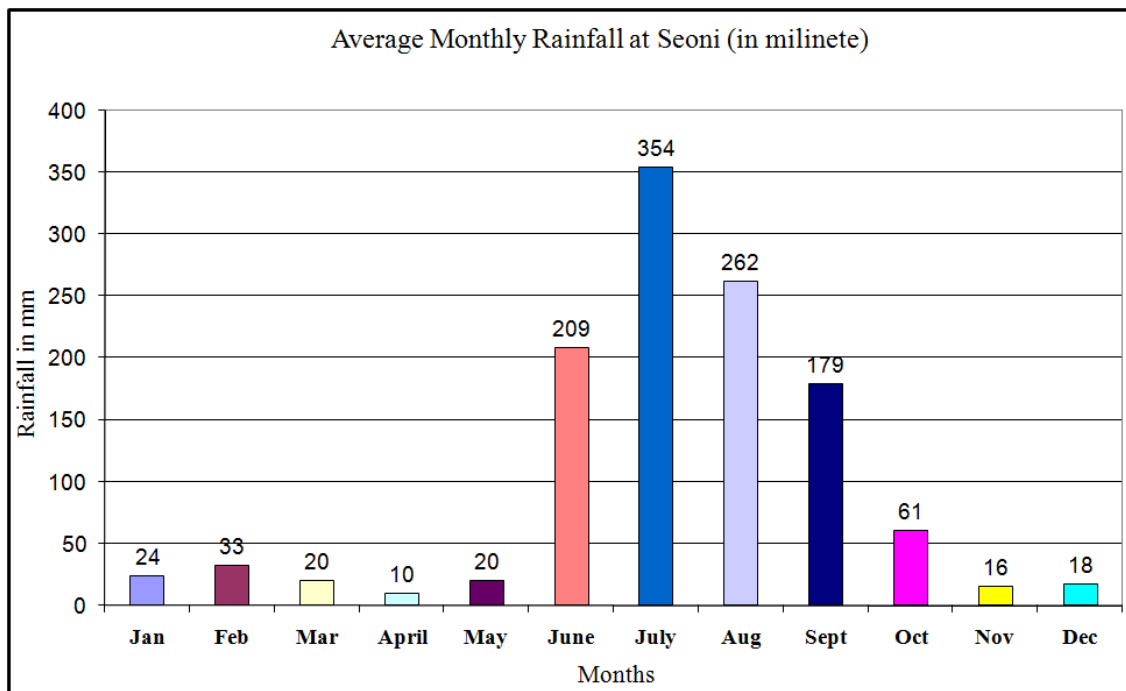
The winter season starts from November and continues till the end of February. January is the coolest month. The mean minimum temperature is 11.8°C. Frost is not common in the area, but the relative humidity becomes very high during the night and the incidence of dew is heavy. Most of the grass species shed their seeds and gradually become dry and coarse by this. The predominant grass species *Heteropogon contortus*, *Themeda triandra*, *T. quadrivalvis* and *Aristida spp.* becomes too coarse and tall to be eaten by most herbivores. This month marks the onset of food and water scarcity for many animals, which becomes acute by the end of the winter season. Winter rains in December, January, February are helpful in the year of low rainfall; it helps in replenishing the drying water holes as well as in keeping the grasses green in low-lying localities. The migratory waterfowl in large flocks in Totaladoh reservoir and many tanks in the PA including Bodanala, Gumtara, Doodhgaon, Potia etc are common. Crop raiding in adjacent cultivated areas, specially by blue bull, wild boar and Cheetal, increases during this period.

## 2.4.2 Rainfall –

Rain is the source of maximum annual precipitation in the area other than mist, fog and dew. Monsoon is the main source of rainfall, though pre- monsoon showers and some times winter rains are also experienced in this area. The average month wise rainfall is presented below. The detail month wise year wise rainfall data is given in **Annexure No. - 14**

**Table No. - 06**  
**The month wise average Rainfall data recorded at Seoni**

Season	Month	Monthly Rainfall	
		Milimeter	Percentage
Rainy Season	June	209	17.33
	July	354	29.35
	August	262	21.72
	September	179	14.84
	<b>Total</b>	<b>1004</b>	<b>83.25</b>
Winter Season	October	61	5.06
	November	16	1.33
	December	18	1.49
	January	24	1.99
	February	33	2.74
	<b>Total</b>	<b>152</b>	<b>12.60</b>
Summer Season	March	20	1.66
	April	10	0.83
	May	20	1.66
	<b>Total</b>	<b>50</b>	<b>4.15</b>
<b>Grand Total</b>		<b>1206</b>	<b>100</b>



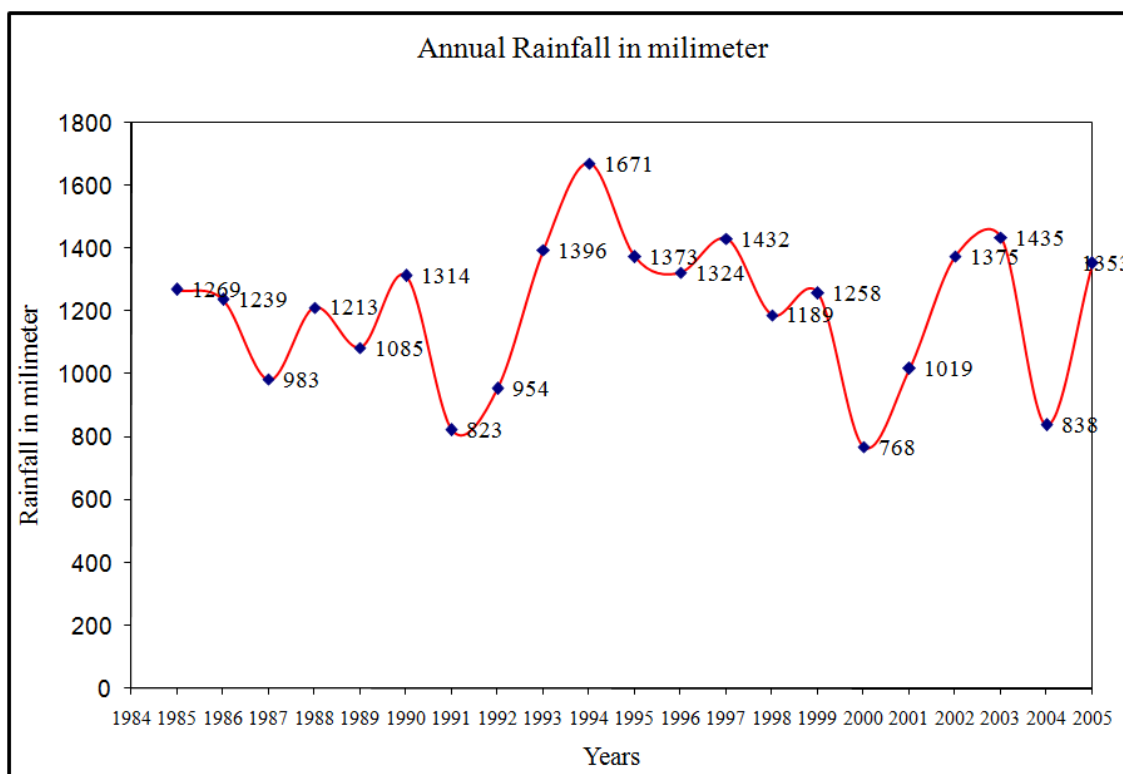
The Average Month wise rainfall shown in the histogram depicts that maximum of rainfall is received during the rainy season (June to September). Winter rains experienced in November to February is also extremely useful for wildlife as it assures the longevity of water sources in the PA.

To know the pattern of rainfall from 1985 to 2012, yearly rainfall data is given in following table –

**Table No. - 07  
Detail of Total Yearly Rainfall in PTR**

Year	Rainfall in milimeter	Year	Rainfall in milimeter	Year	Rainfall in milimeter
1985	1269	1992	954	1999	1258
1986	1239	1993	1396	2000	768
1987	983	1994	1671	2001	1019
1988	1213	1995	1373	2002	1375
1989	1085	1996	1324	2003	1435
1990	1314	1997	1432	2004	838
1991	823	1998	1189	2005	1353

The average rainfall for the Seoni is 1206 on the basis of last 21 years data, so the rainfall less then 1000 mm is considered as drought year. Analysing the yearly rainfall data shows that there is no regular pattern for good rainfall and drought years, but after a good rainfall for three years a PA Manager may be ready for a drought year.



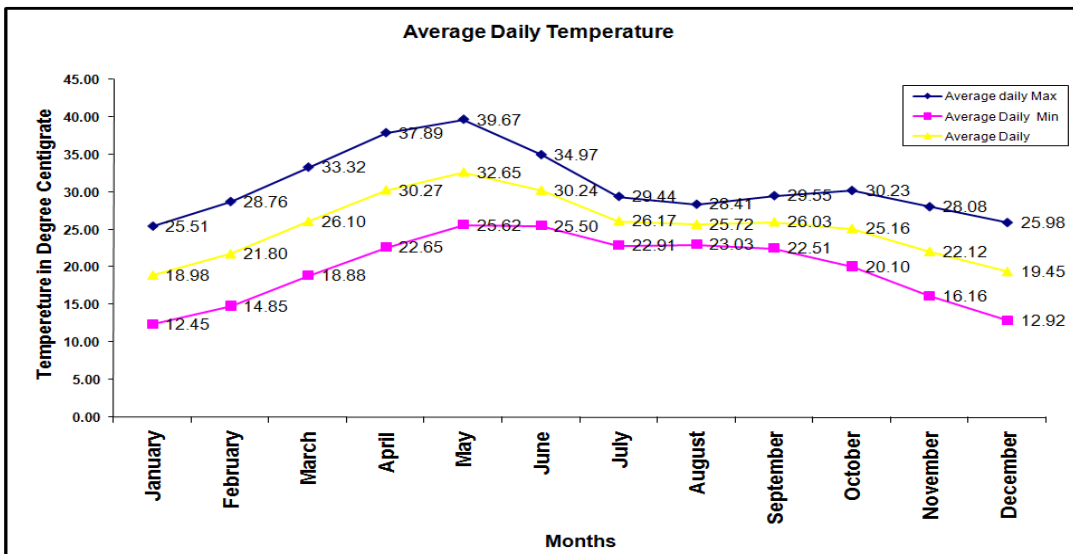
### 2.4.3 Temperature –

In Pench Tiger Reserve, Highest maximum temperature is 47.6°C, recorded in the May 1975 & lowest minimum temperature is 2.7°C, recorded in January 1974. Temperature fluctuation in day and night according to the seasonal changes is a limiting ecological factor on physiology of animals. Its impact appears different on cold and warm-blooded animals. The daily temperature rise and fall regulates not only the behavioural activities of animals but also their physiological activities. The Month wise average daily Max. & Min. Temperature is given in following table -

**Table No. - 8**  
**Month wise average daily Max. & Min. Temperature (1985 to 2005) in PTR**

S.No.	Month	Temperature (°C)			
		Average daily Max	Average Daily Min	Average Daily	Average Daily difference
1	January	25.51	12.45	18.98	13.05
2	February	28.76	14.85	21.80	13.91
3	March	33.32	18.88	26.10	14.44
4	April	37.89	22.65	30.27	15.24
5	May	39.67	25.62	32.65	14.04
6	June	34.97	25.50	30.24	9.47
7	July	29.44	22.91	26.17	6.54
8	August	28.41	23.03	25.72	5.37
9	September	29.55	22.51	26.03	7.03
10	October	30.23	20.10	25.16	10.13
11	November	28.08	16.16	22.12	11.91
12	December	25.98	12.92	19.45	13.06
Yearly Average		30.98	19.80	25.39	11.18

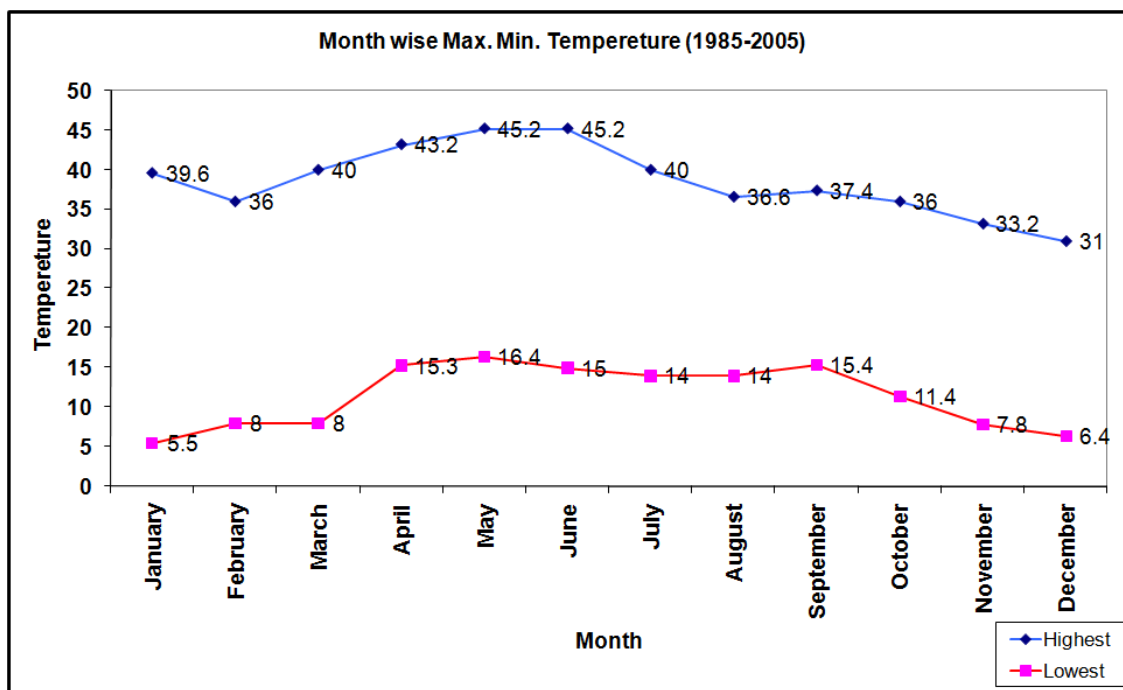
Month wise average daily minimum and maximum temperature since year 1985 is presented below–





**Table No. - 9**  
**Month wise Max. and Min Temperature (1985 to 2005) in PTR**

S.No.	Month	Maximum (°C)			Minimum (°C)		
		Lowest	Highest	Difference	Lowest	Highest	Difference
1	January	26.20	39.60	13.40	5.50	11.10	5.60
2	February	29.20	36.00	6.80	8.00	15.00	7.00
3	March	34.00	40.00	6.00	8.00	20.20	12.20
4	April	37.70	43.20	5.50	15.30	20.00	4.70
5	May	40.00	45.20	5.20	16.40	26.60	10.20
6	June	33.00	45.20	12.20	15.00	29.00	14.00
7	July	29.80	40.00	10.20	14.00	23.00	9.00
8	August	28.40	36.60	8.20	14.00	23.00	9.00
9	September	28.40	37.40	9.00	15.40	22.90	7.50
10	October	29.60	36.00	6.40	11.40	19.80	8.40
11	November	26.30	33.20	6.90	7.80	17.20	9.40
12	December	25.10	31.00	5.90	6.40	14.00	7.60



The highest maximum temperature 47.60C was recorded in May 1975 & the lowest minimum temperature 2.70C was recorded in January 1974.

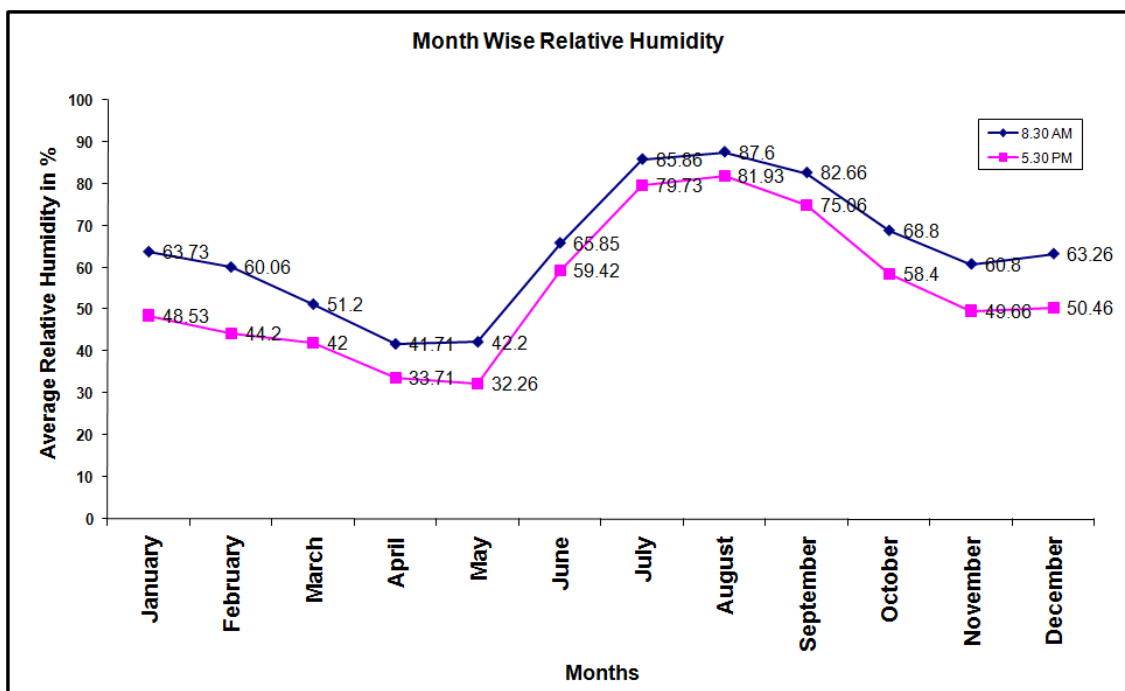
The above temperature chart reveals that June is the hottest and December is coolest month of the year. Both of these months shrink the biological activities of lower vertebrate and invertebrate fauna and cold-blooded animals. Desiccating cold and dry summer both induce the hibernation among these animals. Higher vertebrates like mammalian and avian fauna also intend to pass hot hours of the day near the moisture or under the shade. The den, cave, cliff, overhangs, nests are occupied during the severe cold.

#### 2.4.4 Relative Humidity :

The other factors affecting the forest and wildlife, relative humidity is one of them. The detail information recorded at 8.30 AM & 5.30 PM at Seoni Station for the period from 1985 to 1999 is given in **Annexure No. – 15**. The information recording month wise average relative humidity is given in the following table –

**Table No. - 10**  
**Detail of Relative Humidity in PTR**

Month	Average Relative Humidity in %		Month	Average Relative Humidity in %	
	8.30 AM	5.30 PM		8.30 AM	5.30 PM
January	63.73	48.53	July	85.86	79.73
February	60.06	44.20	August	87.60	81.93
March	51.20	42.00	September	82.66	75.06
April	41.71	33.71	October	68.80	58.40
May	42.20	32.26	November	60.80	49.66
June	65.85	59.42	December	63.26	50.46



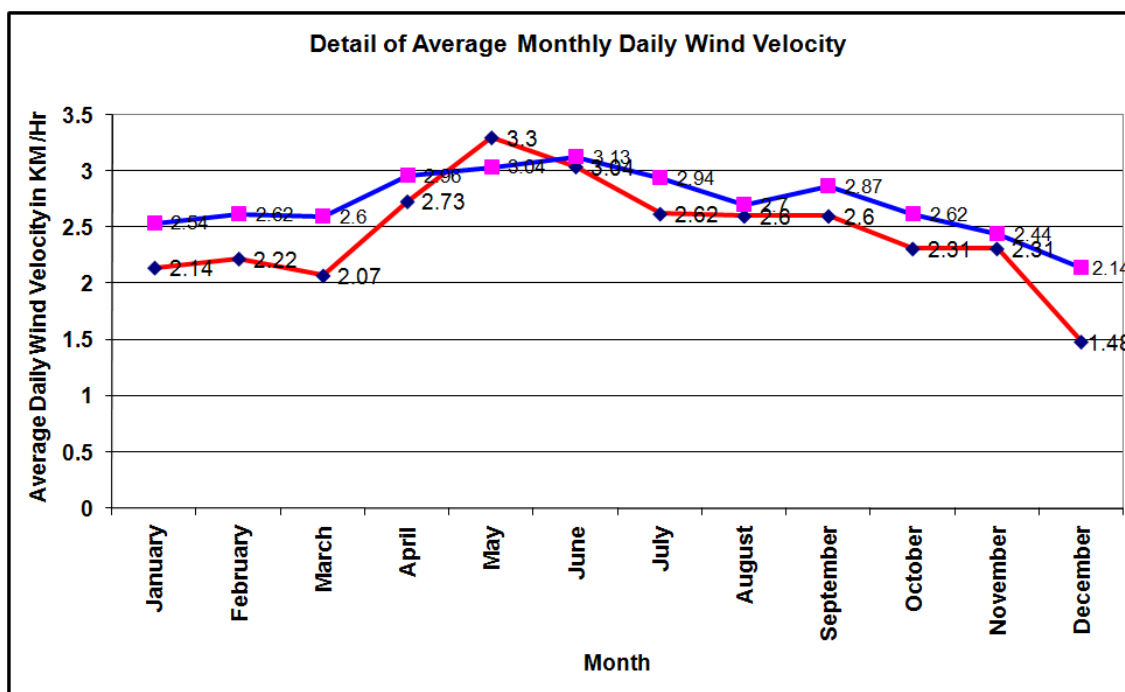
#### 2.4.5 Winds –

Occasional high velocity wind during September and March has been experienced in this area. The most susceptible to such winds are the shallow rooted trees on hill slopes, which are readily uprooted during storms.

The wind velocity is recorded by Indian Weather Department, Nagpur for Seoni for the period 1985 to 1999 is given in detail on **Annexure No. – 16**. The detail of Average monthly daily wind velocity at 8.30 AM & 5.30 PM is given below –

**Table No. - 11**  
**Detail of Average Monthly Daily Wind Velocity in PTR**

Month	Average Daily Wind Velocity in KM /Hr		Month	Average Daily Wind Velocity in KM /Hr	
	8.30 AM	5.30 PM		8.30 AM	5.30 PM
January	2.14	2.54	July	2.62	2.94
February	2.22	2.62	August	2.60	2.70
March	2.07	2.60	September	2.60	2.87
April	2.73	2.96	October	2.31	2.62
May	3.30	3.04	November	2.31	2.44
June	3.04	3.13	December	1.48	2.14



#### 2.4.6 Frosts –

It is uncommon in the plateau area and it does not have any serious **effect on vegetation or on fauna.**

### 2.5 Hydrology & Water Source

#### 2.5.1 Natural Water Source:

The National park and Sanctuary area is criss-crossed by number of streams and nalas, but most of them are seasonal. The Pench river flowing almost through the central of the park becomes dry by the end of March leaving behind few pools of water which are locally known as 'kassa' or 'Doh'. There are very few perennial springs (Jhirs) and seeps. It is obvious; that most of the habitats completely lacks natural water holes during the summer season. The detail of perennial and ephemeral water holes found in PTR and the availability of water in relation to rainfall during different year is given in **Annexure No. – 17 (A & B)**. The detail of Doh distribution is shown in maps.

## **2.5.2 Artificial Water Source:**

Despite of sufficient annual rainfall about 1200 mm, the water available during Pinch period in the Tiger Reserve is very low and is only in few water pools, springs and seeps. The main reason for this is the water holding capacity of the soil, which is very low, as the most of soil is Sandy with pebbles. A great efforts have been made in past to make efficient water management for wildlife.

It is observed that due to poor water holding capacity of the soil, the stop dams and very small tanks like Chhindbarri talab do not retain water till the end of June. During last five years few tanks and Dykes were created, which solved the problem of water during the pinch period of year 2002, 2003, 2004, 2006, 2007 & 2008. But rainfall in the year 2004 was very low i.e. only 838 mm. so only few large tanks had water till the end of summer of 2005. The hand pumps and few tankers were used to supply water and this has full fill the requirement of water. The detail of artificially created water holes and hand pump is given in **Annexure No. – 18 (A, B, C, D, E & F)** and their position is shown on map.

## **2.5.3 Quasi Wetlands: -**

A vast area of 54.51 Sq. Km, in the southern central part of the park has come under submergence in the year 1990 due to construction of a multi-purpose reservoir at Totaladoh. The reservoir is at its maximum water level during rainy season, recedes slowly and is at lowest level just prior to monsoon. In the draw down area, seasonally much herbaceous and grassy vegetation appear. This partially submerged area, with a lot of moisture, created an ecotone in an otherwise monotonous forest belt. This has resulted into aggregation of Cheetal, Sambhar, Blue bull, Wild boar and Gaur in this area during late winter and summer. Apart from this, there are few small irrigation tanks near the periphery of the Sanctuary and Park. All these quasi wetland attract many migratory and residential aquatic avi-faunas.

All these quasi wetland due to their close vicinity to the village, have been under constant disturbance from people and their cattle. The Totaladoh reservoir was under constant illegal fishing pressure due fishing rights granted by government, subsequently rights have been acquired with the direction of Hon. Supreme Court, but still there is constant threat for the illegal fishing.

## **2.6 Vegetation and Cover Types:**

### **2.6.1 Vegetation:**

#### **2.6.1.1 Biogeographic Classification :**

Pench Tiger Reserve is part of the Indo-Malayan Realm floristically and a member of the Oriental Region Zoo-geographically. As per the Bio-geographic classification of India (Rodger and Panwar, 1988), the area lies in Zone – 6 e – Deccan Peninsula – Central Highlands.

### 2.6.1.2 Forest Types:

Based on the revised classification of forest by Champion and Seth, the following three types of forest are found in this areas: -

1. **3B/C1c -South Indian Tropical Moist Deciduous Forest - Slightly moist Teak Forest.**
  2. **5A/C1b - Southern Tropical Dry Deciduous Forest - Dry Teak Forest.**
  3. **5A/C3 - Southern Tropical Dry Deciduous forest – Southern Dry Mixed Deciduous Forest.**
- 
1. **3B/C1c -South Indian Tropical Moist Deciduous Forest - Slightly moist Teak Forest.**

All the teak forest of Southern slopes of Satpura range, stretching from South West Kandlai to Karmajhiri along Pench river and area near Totaladoh dam of Gumtara range has been classified under this category. This classification is based on the average rainfall received in Seoni district over past 95 years, which is around 1300 mm. (As per Working Plan of South Seoni Division by Shri S.D. Dwivedi)

2. **5A/C1b - Southern Tropical Dry Deciduous Forest - Dry Teak Forest.**

Almost 29% of National Park and 35% of Sanctuary area is covered under this forest type. This type of forest is found on plain ground as well as on the hill slopes. The density of such forest ranges from 0.6 to 0.8 and Teak forms about 25% to 50% of the total crop composition.

3. **5A/C3 - Southern Tropical Dry Deciduous forest – Southern Dry Mixed Deciduous Forest.**

About 65 % area of National Park and Sanctuary falls under this forest type.

There is no sharp and permanent dividing line between above two sub types of Dry deciduous Forests in the Pench National park and Pench Sanctuary area. The local variations gradually merge into one another and are found intermingled over relatively small areas.

### 2.6.1.3 Floristic composition –

#### (i) **Overwood :**

The associates of Teak are Dhawda (*Anogeissus latifolia*), Lendia (*Lagerstroemia parviflora*), Saja (*Terminelia tomentosa*), Salai (*Boswellia serrata*), Moyan (*Lannea coromandelica*), Mahua (*Madhuca indica*), Dhoban (*Dalbergia paniculata*), Mokha (*Schrebera swietenoides*), Siras (*Albizia odoratissima*), Tendu (*Diospyros melanoxylon*), Bija (*Pterocarpus marsupium*), Tinsa (*Ougeinia oojeinensis*) & scattered trees of Shisham (*Dalbergia latifolia*), Semal (*Bombax ceiba*), Haldu (*Adina cordifolia*) also occur. The trees of Koha (*Terminalia arjuna*) and Jamun (*Syzygium cumini*) are found along the bank of river.

**(ii) Underwood :**

There is generally an underwood of middle density comprising of Aonla (*Emblica officinalis*), Dhaman (*Grewia tiliaefolia*), Kumbhi (*Careya arborea*), Ghont (*Zizyphus xylopyra*), Baranga (*Kydia calycina*), Amaltas (*Cassia fistula*), Ashta (*Bauhinia racemosa*), Papara (*Gardenia latifolia*), etc. Bamboo (*Dandrocalthamus strictus*) occurs sparsely, restricted to some valley of Compartment No. 597, 599, 613, 614, 593, 594, 1463, 1464 & 1465.

**(iii) Shrubs :**

Bekal (*Gymnosporia spinosa*), Dhawai (*Woodfordia fruticosa*), Karonda (*Carissa carandas*), Jhau (*Tamaryx dioica*) (occurs in river beds)

**(iv) Grasses :**

*Apluda mutica*, *Digitaria setigera*, *Heteropogon contortus*, *Eragrostis tenella*, *Themeda quadrivalvis*, *T. triandra*, *Setaria glauca*, *Sorghum halepense*, *Sehima nervosum*, usually occur in the ground flora along with many other grass species.

**(v) Climbers :**

Chilati (*Acacia pinnata*), Mahulbel (*Bauhinia vahlii*), Palasbel (*Butea superba*), Lal bel (*Ventiliago madraspatana*), etc.

**(vi) Weeds :**

Weeds are prevalent in the over grazed area in most of the area of Sanctuary and Park. The common weeds are Gulmehandi (*Lantana camara*), Chirota (*Cassia tora*), Van Tulsi (*Hyptis suaveolens*) and *Parthenium* species. The *Parthenium* species occurs in open areas near Alikatta and Chhedia forest village as well as along the entire submergence area of the Pench river.

A detailed study of floristic composition of Pench Tiger Reserve is conducted by Shri N.S. Dungriyal, Field Director, Pench Tiger Reserve during his field visit. The detail of his study is given in **Annexure No. – 19**. It contain a total of **184** species of trees, **128** species of shrub, 515 species of herbs plants along with **112** species of climbers, 127 species of grasses, 25 species of fungi & lichen, 7 species of bryophyte & 10 species pteridophyte identified in Pench Tiger Reserve.

**2.6.1.4 Phytosociology –**

This study was carried out by State Forest Research Institute, Jabalpur for Pench Tiger Reserve as "Floristic Survey Vegetation Description Conservation Status and Distribution of Rear and Endangered Plant Communities of Pench Tiger Reserve, Seoni" under Eco-development Project. As per the study Pench Tiger Reserve has following plant communities –

1. Tinsa Dominant Community
2. Saja Dominant Community
3. Dhawra Dominant Community
4. Jamun Dominant Community
5. Mawai Dominant Community
6. Karra Dominant Community
7. Lendia Dominant Community
8. Tendu Dominant Community
9. Teak Dominant Community

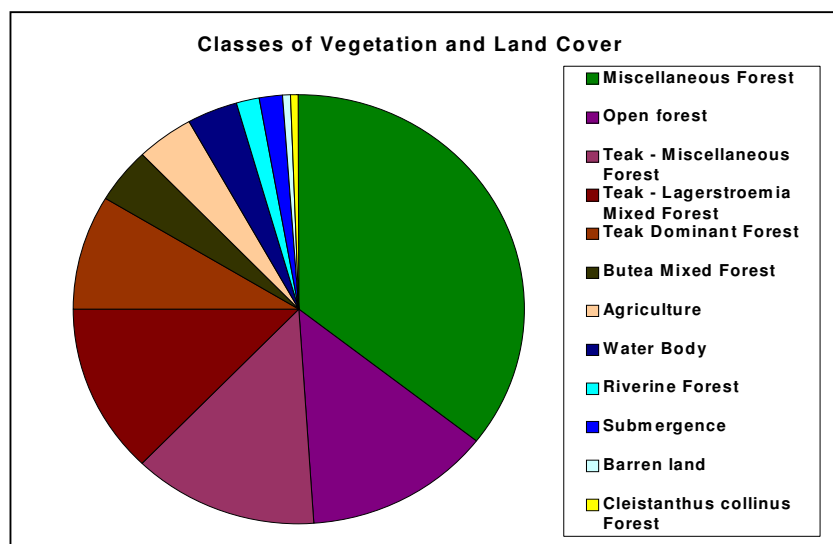
The detail information about of each community is given in the report submitted by SFRI, Jabalpur.

### 2.6.1.5 Vegetation and Land Cover –

Based on LISS III digital data twelve different vegetation and land cover categories have been delineated in PTR. The detail of different land cover is shown in following table.

**Table No. - 12**  
**Vegetation and land cover classes in PTR**

	Vegetation/Land Cover Class	Extent (km <sup>2</sup> )	Percentage
1	Miscellaneous Forest	269.65	35.57
2	Open forest	101.70	13.42
3	Teak – Miscellaneous Forest	99.96	13.19
4	Teak – <u>Lagerstroemia</u> species Mixed Forest	97.08	12.81
5	Teak Dominant Forest	64.72	8.54
6	<u>Butea</u> species Mixed Forest	33.19	4.38
7	Agriculture Land	30.23	3.99
8	Water Body	28.42	3.75
9	Riverine Forest	12.50	1.65
10	Submergence	11.74	1.55
11	Barren land	4.31	0.57
12	<u>Cleistanthes collinus</u> Forest	4.39	0.58



**(i) Miscellaneous Forest :**

This forest type constitutes association of *Boswellia serrata*, *Anogeissus latifolia*, *Buchnanian lanzan*, *Lannea coromandelica*, *Miliusa velutina*, *Bauhinia racemosa* and *Soymida febrifuga*.

**(ii) Open Forest :**

This forest is present on the fringes of villages close to agriculture land and place like Alikatta and Chhediya with patches of grassland. The tree species in this forest type are *Madhuca indica*, *Butea monosperma*, and *Diospyros melanoxylon*.

**(iii) Teak-Miscellaneous Forest :**

Teak dominates 50% of this vegetation type followed by other species such as *Terminalia tomentosa*, *Bauhinia racemosa*, *Ougenia oojeinensis* and *Grewia tiliaefolia*.

**(iv) Teak-Lagerstroemia parviflora Forest :**

Teak and *Lagerstroemia* species occur in equal proportions along with a few other species.

**(v) Teak - Dominant Forest :**

Teak dominates in more than 75 % of this vegetation type followed by other species such as *Millusa velutina*, *Terminalia tomentosa*, and Bamboo (*Dendrocalamus strictus*)

**(vi) Butea Mixed Forest :**

*Butea monosperma* inter mixed with *Lagerstroemia parviflora*, *Madhuca indica* and very few *Zizyphus mauritiana*.

**(vii) Agriculture Land :**

There is 30.23-sq. km. of agricultural land included in the Buffer zone of Pench Tiger Reserve. The main crop cycle, consist of two crops in a year, which is almost rain fed.

**(viii) Water Body :**

Pench reservoir is the main water body along with some small to medium sized tanks like Kohka, Ambadi, Jeerewada, Potia, Raiyarao, Jamtara, Gumtara, Pathri and Dudhgaon. These water bodies cover about 28.42 sq.km. area of Pench Tiger Reserve.

**(ix) Riverine Forest :**

Riverine vegetation is an association of *Terminalia arjuna*, *Ixora parviflora*, and *Terminalia tomentosa*.



**(x) Submergence :**

The draw down area coming under the permanent submergence of Totladoh reservoir is 11.74 sq. km.

**(xi) Barren land :**

4.31 sq. km. of Pench riverbed in length comes under this category when flow of water ceases and river dries up.

**(xii) Cleistanthus collinus Forest:**

This vegetation type is a mono specific dominant patches where more than 98% of the species is Cleistanthus collinus.

**(xiii) Grassland communities :**

All the grassland and open forest having very high grass composition is anthropogenic in origin. A detail opportunistic survey by conducted by Shri N.S. Dungriyal, FD, PTR in which 127 number of grass & bamboo species have been identified in grassland and grass bearing open forest of Pench Tiger Reserve. The details of grass present in Pench Tiger Reserve in given in **Annexure No. - 20**

The following associations of various grass species has been recognized in the Core Area of Pench Tiger Reserve -

**(i) Heteropogon contortus - Themeda triandra Community -**

This community has Rottboellia exltata, Apluda mutica, Seteria glauca, Paspalidun flavidum, Bothriochloa odorata, Digitaria granularis, Sorghum halepense and associates.

This can be seen in comptt. along Allikatta-Karmajhiri road, near Mannu talab along Gurshalghat- Baghdeo Road.

**(ii) Themeda quadrivalvis- Apluda mutica-Rottboellia exaltata community-**

This community has Iseilema laxum, Bothriochloa pertusa, Eragorstis tenella, Rottboellia performata. It can be seen in compartments along Kala Pahar- Piorthari-Chhindimatta road and along Karmajhiri-Raiyakassa-Chhediya ghat road.

**(iii) Heteropogon contortus - Digitaria granularis community -**

Associated with Apluda mutica, Aristida adsensionis, Sorghum hapelens Eragorstis tenella- seen in comptt. 614, 613, 590 and 586.

**(iv) Heteropogon contartus - Bothriochloa pertusa community-**

Associated with Eragrostis tenella, Dactyloctenium aegypticum, Chloris barbata, Hackelochloa granularis, Echinochloa colonum, Paspalidium flavidum, Brachiaria ramosa, Eragrostis, bifaria, Setaria tomentosa Oplismenus burmani Alloterops cimicina, Cynodon dactylon, it can be seen in open forest area of Turia, Khamrith and Satosha beats.

**(v) Saccharum spontaneum community-**

Associated with Coix gigantea, Eragrostis diarrhena, Imperata cylindrica along the river Pench, near Raiyakassa, Chhedia, Bodanala, Bansnala and other moist localities.

**(vi) Eragrostis tenella community -**

In some areas on shallow soils, pure extensive patches of Eragrostis tenella is present. This can be seen in comptt. 598, 599 and 583 of Alikatta circle.

**2.6.1.6 Forest Cover :-**

Forest Survey of India took up a study in 2004 to assess the current status of forest cover in existing Tiger Reserves and also detected changes that have taken place during the past five years. As per the study the forest cover in Pench Tiger Reserve Seoni is as following :-

**Table No. - 13**  
**The Forest Cover in Pench Tiger Reserve Seoni (1997-2002)**  
(Area in Km<sup>2</sup> )

Category	Assessment Year			Net Change (1997-2002)
	1997	2000	2002	
(A) Very Dense Forest	96	96	96	-
(B) Moderately Dense Forest	397	397	397	-
(C) Open Forest	100	100	100	-
<b>Total (A+B+C)</b>	593	593	593	-
Scrub	-	-	-	-
Non-Forest	165	165	165	-
<b>Total Area</b>	758	758	758	-

There was no perceptible change in forest cover during the period 1997-2002.

**2.6.1.7 Forest Cover in Outer Surround**

As per the report of Forest Survey of India the outer surround of Pench Tiger Reserve has a geographic area of 2,267 km<sup>2</sup> out of which 239 km<sup>2</sup> falls in Pench Tiger Reserve, Maharashtra, 1,729 km<sup>2</sup> Madhya Pradesh and 299 km<sup>2</sup> in Maharashtra. The forest cover in the outer surround lying in Madhya Pradesh and Maharashtra (area 2,028 km<sup>2</sup>) for the three assessments is given in following table –

**Table No. - 14**  
**Forest cover in the Outer Surround of PENCH Tiger Reserve (1997-2002)**  
 (Area in Km<sup>2</sup>)

Category	Assessment Year			Net Change (1997-2002)
	1997	2000	2002	
(A) Very Dense Forest	105	105	105	-
(B) Moderately Dense Forest	460	460	459	-1
(C) Open Forest	242	242	241	-1
<b>Total (A+B+C)</b>	807	807	805	-2
Scrub	1	1	1	-
Non-Forest	1,220	1,220	1,222	2
<b>Total Area</b>	2,028	2,028	2,028	

The table shows that there is a decrease of 1 km<sup>2</sup> each in moderately dense and open forest during the period 1997-2002. The decrease in forest cover is noticed in Madhya Pradesh only. The likely reasons for the change are the rotational felling for the plantation areas.

## **2.7 Wild Fauna, Habitats and Tropic Niches**

### **2.7.1 Fauna :**

Physiography, Geology, Climate & Precipitation contribute to decide the type of vegetation and habitat of wild animals in the wild ecosystem. The Tiger Reserve harbours flat-hilltops, varying degree of slopes and rolling meadows in the valleys, which offer unique setting and ecotones for creating diverse type of wild habitat, forming ideal niches for various species of plants and animals.

### **Faunal Survey by ZSI -**

A detail of Faunal Survey and Study on Wetlands and Riparian Areas was conducted by PENCH Tiger Reserve through Zoological Survey of India. As per the report submitted by ZSI "Study on Wetlands and Riparian Areas in PENCH Tiger Reserve in a Focus on diversity and status of fishes waterfowls and mammals" and "Faunal Survey; Focus on Insects, Fishes, Reptiles and Amphibians; conservation status and distribution of rare endangered animals and develop illustrative field guide and contribute for museum collection for fauna occurring in the PENCH Tiger Reserve" - Odonets - 10, Stonefly - 1, Orthoptera 44, Dermaptera 6, Termites 5, True Bugs 14, Beetals 32, Butterflies 45, Moths 56, Fresh Water Fishes 50, Reptiles 30, Amphibians 7, Birds 242 & Mammals 38 species were reported. The detail as per the report submitted by ZSI is given in **Annexure No. – 21**.

### **Faunal Survey by N.S. DUNGRIYAL & SUBHRANJAN SEN -**

Later on Mr. N.S. DUNGRIYAL, Field Director, PENCH Tiger Reserve and Mr. SUBHRANJAN SEN, Deputy Director, PENCH Tiger Reserve studied the Fauna of PENCH Tiger Reserve Seoni in detail during their field visit. During their study they critically analysed the checklist prepared by ZSI. Some of the bird's species, which were reported by ZSI but

not found during their study, were deleted from their check list. On the basis of study of Mr N.S. Dugriyal and Mr. Subhranjan Sen the detail check list of Mammals - 58, Birds 325, Reptiles – 37, Amphibians – 13, Fishes – 50, Butterflies – 105, Moths – 100, Dragon and damshelly – 49, Spiders – 35, and many other invertebrates and insect is given in **Annexure No. 22**

The animals generally seen in the Tiger Reserve are the Chital (*Axix axis*), Sambar (*Cervus unicolor*), Barking Deer (*Muntiacus muntjak*), Chousingha (*Tetracerus quadricornis*), Gaur (*Bos gaurus*), Lmagur (*Presbytis entellus*), Wild Pig (*Sus scrofa*), Jackal (*Canis aureus*), Sloth bear (*Melursus ursinsu*), Wild dog (*Cuon alpinus*), Panther (*Panthera pardus*), Tiger (*Panthera tigris*). Apart from mammals Pench Tiger Reserve offers an ideal habitat for a variety of avifauna, reptiles, fishes, amphibians and invertebrates.

The above typical fauna of the Central Indian Highland, part of the Oriental-Zoological Realm, is an amalgam of Indo-Chinese, Ethiopian and Palaeartic elements (Prater, 1948; Roberts, 1977)

The heterogeneity of habitats influences the local distribution of mammals. The presence of the mosaics of meadows within the woodland, being large expanses of herbage availability, also has a bearing on the concentration of herbivores.

### 2.7.2 Population estimation –

In order to assess the strength of major mammals, population estimation exercise are carried out every year. The following list indicates the population estimation of major animal during the last five years.

**Table No. - 15  
Census Figure (2001-2012)**

Species	2001	2002	2003	2004	2005	2006	2010	2011	2012
Tiger	50	50	55	57	55	27-39 Atult tiger in Pench land scape	65 (53- 78) Tig	-	-
Panther	29	32	39	39	41		-	-	-
Bison	590	686	775	735	727		635	2013	1875
Sambhar	2275	2399	2628	2835	2844		3577	4209	6167
Cheetal	7583	11372	14548	14850	15389		30841	49249	69260
Blue bull	1424	1709	1986	2143	2170		1005	1958	2847
Barking deer	431	417	353	199	202		-	-	-
Wild boar	3143	2994	3107	3289	3374		5431	6638	10328
Wild dog	166	239	264	273	266		-	-	-

The detail of Animal Population Estimation from the beginning of Park and Sanctuary is given in **Annexure No. – 23.**

### **2.7.3 Habitat zones, vegetation zones :-**

In relation to the various plant assemblages, canopy density and other features of various areas, following habitat / vegetation zones can be broadly identified.

#### **Very dense forest with good ground cover -**

Some parts of the Telia, Chikhlakhari, Bodanala, East Thuepani, Awarghani, Alesur, Murer, Khamreeth beat form this type of habitat. The Sambar, Wild Pig, Gaur and Barking deer mainly like this habitat.

#### **(ii) Moderately dense forests with good ground cover-**

Forest area from the edge of the submergence near Chhindimatta and Piyorthadi to Karmajhiri, Tikadi, where soil depth is good, has an average crop density of 0.6. This area is completely protected from grazing by livestock, which has resulted in luxuriant growth of grasses. Regeneration of tree species is adequate. This area runs along the Pench river and Bodanala. Water remains available even during the summer season in some natural jhirs and 'kassa' in the bed and Bodanala tank. This habitat with adjoining open grass land and water holes make most suitable area for Spotted deer. A part from Spotted deer many more animals like Gaur, Sambar, Wild Pig & Blue bull use this area for breeding and summer ground.

#### **(iii) Open forests with luxuriant ground cover-**

This type of crop composition is found in Comptt. 595, 596, 610, 611 of Khamrith, Satocha and Turia beats, Similarly comptt No. 597, 585 and 586 has a low crop density and luxuriant grass ground cover. Few tanks have been created in this area to full fill water requirement during summer season so the wildlife is using this luxuriant grass dominated habitat properly.

#### **(iv) Open forest with weeds**

In most of the areas in Chhindwara district and some parts of Tikadi, Turia, Awarghani, Ambadi, Gandatola, Palari, Alesur, Murer, Khamreeth, Kurai beats of Seoni district, which were earlier prone to grazing, the ground is infested with weeds and have less grass composition. The main weeds are Cassia tora, Van tusli, and Lantana.

#### **(v) Degraded forest with good ground cover**

Some compartments in Gumtara range and comptt. no. 611, Beat Khamreeth of Karmajhiri Range, which are close to habitation and prone to grazing were degraded due to heavy biotic pressure have responded very well and turn in to open shrub type forest having Savannah type community.

**(vi) Sparse forest with no ground cover-**

Some parts of compartment no. 607, 608 & 609 have very poor & highly eroded soil and have sparse tree cover. The ground vegetation is also sparse and water is almost absent during summer.

**(vii) Meadows & Grasslands-**

The sites of relocated villages and area with heavy biotic pressure in past has now developed in to good meadows. The main grass lands are Alikatta, Chhediya, Pyorthari, Chhindewani etc.

**(viii) Artificially created wet-land –**

The construction of multipurpose dam near Totladoh in the year 1990 has created a vast reservoir in the Core Area of PTR. Due to this an area of 54 sq. km. has come under submergence in the south central part of the PTR. During rainy season water level reaches to highest level and slowly recedes during winter and summer. This creates draw down area with a lot of moister and luxuriant green grasses like Cynodone dactylon etc. during late winter and summer season. This artificially created reservoir forms a valuable wetland. This wetland harbors almost 50 species of fishes, many species of reptiles including turtle and crocodile and many species of migratory as well as resident waterfowls.

**2.7.4 Plants of different value to wild life:**

The forest ecosystem has various established food chains incorporating a vast variety of plants and animals. Herbivores of different feeding habits consume not only the grasses but various tree species also. The detail is given in following table –

**Table No. - 16  
Plant species and their parts used by wild animals**

S. No	Plant Species	Habit	Parts used			
			Fruits	Flower	Leaves	Bark
1.	Ber	Tree	*	-	*	-
2.	Ghont	“	*	-	*	-
3.	Achar	“	*	-	-	-
4.	Kusum	“	*	-	*	-
5.	Babool	“	*	-	*	-
6.	Baheda	“	*	-	-	-
7.	Jamun	“	*	-	-	-
8.	Mahua	“	*	*	-	*
9.	Tendu	“	*	-	*	-
10.	Karonda	Shrub	*	-	-	-
11.	Lasaura	Tree	*	-	*	-
12.	Kasai	“	*	-	*	-
13.	Aonla	“	*	-	*	-
14.	Pipal	“	*	-	*	-

15.	Bargad	“	*	-	*	-
16.	Gular	“	*	-	*	-
17.	Bel	“	*	-	*	-
18.	Semal	“	-	*	*	-
19.	Mango	“	*	-	-	-
20.	Tinsa	“	-	-	*	-
21.	Palas	“	*	*	-	-
22.	Bija	“	-	-	*	-
23.	Amaltas	“	*	*	-	*
24.	Kachnar	“	*	*	*	-
25.	Khair	“	-	-	*	-
26.	Reonjha	“	*	-	*	-
27.	Siras	“	-	-	*	-
28.	Saja	“	-	-	*	-
29.	Dhaoda	“	-	-	*	-
30.	Kumbhi	“	*	*	*	-
31.	Haldu	“	-	-	*	*
32.	Sewan	“	-	-	*	-
33.	Bamboo	“	-	-	*	-
34.	Chirol	Tree	*	-	*	-
35.	Teak	“	-	-	-	*
36.	Mundi	“	-	-	*	-
37.	Papra	“	*	-	-	-
38.	Dhaman	“	-	-	*	-
39.	Flacourtia	“	-	-	*	-
40.	Marod phali	Shrub	-	-	*	-
41.	Lantana	“	-	*	*	-
42.	Jangli tuar	-	*	-	*	-

The following species seen to be heavily browsed by Spotted Deer, Sambhar, Blue Bull, Four horned Antelope –

**Table No. – 17**  
**Plant species heavily browsed by Herbivores**

S.No.	Hindi Name	Botanical Name
1.	Ber	<i>Zizyphus mauritiana</i>
2.	Ashta	<i>Bauhinia racemosa</i>
3.	Rohan	<i>Soymida fabrifuga</i>
4.	Saja	<i>Terminalia tomentosa</i>
5.	Tendu	<i>Diospyros melanoxylon</i>
6.	Khair	<i>Acacia catechu</i>
7.	Ainthy	<i>Helictres isora</i>
8.	Aonla	<i>Embllica officinalis</i>
9.	Dhaora	<i>Anogeissus latifolia</i>

### 2.7.5 Status of Rare & Endangered Species :

Pench Tiger Reserve is known for successfully conserving Tiger, which is regarded as the most threatened species, almost on the verge of extinction in all tiger range countries in the world. No species of wildlife has captured the imagination and sentiments of international communities in the conservation history as spontaneously as tiger, evoking a tremendous response from all the concerning quarters. The World community of wildlife conservationists has focused its attention on the mobilization of international opinions & efforts to bring this species back to the safer status of its populations. The tiger population has shown a remarkable upward trends since the formation of this tiger reserve.

Apart from the tiger, some other species of the same status yet of lesser renowned/publicity found in the Tiger Reserve are as following –

#### 1988 IUCN Red List of Threatened Animals Found in Pench Tiger Reserve -

##### Mammals :

- |    |                     |   |                               |
|----|---------------------|---|-------------------------------|
| 1. | Dhole               | – | <i>Cuon alpinus</i>           |
| 2. | Bengal Fox          | – | <i>Vulpes bengalensis</i>     |
| 3. | Sloth Bear          | – | <i>Melursus ursinus</i>       |
| 4. | Smooth Coated Otter | – | <i>Lutra perspicillata</i>    |
| 5. | Leopard             | – | <i>Panthera pardus</i>        |
| 6. | Tiger               | – | <i>Panthera tigris tigris</i> |
| 7. | Gaur                | – | <i>Bos gaurus</i>             |

##### Birds

1. All Gyps species (Vultures)

##### Reptiles

1. Indian Python – *Python molurus*

### 2.7.6 Locally Extinct species -

#### (i) Elephant - (*Elaphus maximus*)

Ain - i-Akabari contains some reference regarding presence of elephant in the lower Pench valley during sixteenth century, but there is no such indication in records pertaining to eighteenth century. It is therefore apparent that elephants became extinct by the turn of seventeenth century.

#### (ii) Barasingha (*Cervus duvaucelli branderi*) –

The hard ground Barasingha, mentioned by caption J. forsythia (1889) in "Highlands of Central India", appear to have become extinct locally by early twentieth century.



**(iii) Cheeta (*Acenonyx jubatus*)-**

The Cheeta, which used to be, encountered occasionally till the early twentieth century (Meiyer brooke) became extinct by the middle of this century.

**2.8 Major conspicuous Changes in the Habitat Since Inception –**

The following changes have been recorded in the wildlife habitats of Pench since its inception –

**1. Clear felling in the hart of Park for Reservoir-**

Near the Pench river there was a luxuriant forest growth, which came under submergence due to construction of dam. In this part of the pench river, there were a lot of doh, kassa and riparian vegetation of many lofty trees like *Terminelia arjuna*, Jamun etc. making it an ideal riparian area. This was the most favoured ground for Tiger during summer season. Due to submergence a vast draw down area has appeared, which became very use full area for herbivores. Due to increase in number of prey base in this area, this became a favoured hunting ground for tiger. Near the submergence area the forest edge is covered with dense lantana growth in many part of the National Park which provide suitable hunting resting and breeding ground for tiger and its co-predator.

**2. Strict protection from fire –**

During last 7 – 8 year the fire cases are almost nil due to strict protection major. Due to this a good regeneration of woody species is coming up.

**3. Relocation of villages –**

Two villages namely Alikatta and Chhediya were relocated by forest department and six villages namely Chhindewani, Umrighat, Palaspani, Piyorthadi, Sapat & Kandlai were relocated by irrigation department. These relocated villages sites have metamorphosed into heterogeneous grasslands and draw down area.

4. Due to habitat development measures the overall water availability within the habitat has improved.

5. Due to over use of the habitat at certain places (e.g. Alikatta meadow) by spotted deer, depletion of ground cover along with the weed infestation and soil erosion are discernable.

6. In high prey density area regeneration of tree and shrub species is poor.

**7. Strict grazing control –**

Due to strict grazing control in Sanctuary and Gumtara area and few peripheral compartment of Karmajhiri range, the area has developed in to a good habitat for major herbivore. Now these habitat are being used by many mega herbivore like Gaur and Sambar, which is the indicator of tremendous improvement in the habitat.

**8. Strict control on illegal fishing –**

After the settlement of fishing right of 305 fishermen in Totladoh reservoir and final notification of Park, the illegal fishing activities have come down drastically due to strict patrolling & control. This brought a favourable change in the reservoir of the Park.

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