

during the month of December and January. There is no rain gauge station within the sanctuary. The details of rainfall data for nearby rain gauge stations around the sanctuary are given in Appendix-VII. There are very few records of thunderstorms in the area. Dew is very heavy in the month following the Monsoon and persists in some places till February.

## 2.5 Water Sources

### 2.5.1 Natural Water Sources

The rivers Ghod, Goheri and the Bhima have their origin within the BWS. Thus the Bhimashankar plateau is dissected by several streams excavating deep gorges. The river Goheri which meets the Ghod south to Patan drains the western part of the Bhimashankar plateau. The Nagoda and the Waghya nallahs are some of the important nallas of the sanctuary. Other perennial water holes of the area are Bhakadevi, Bhatycha Ran, Hanuman Lake and Khondhwal lake.

### 2.5.2 Artificial Water Sources

A survey was carried out to map the natural, seasonal and perennial water sources in the BWS. To supplement the natural water sources during the lean period, artificial water sources were created depending on the necessity by crescent shaped structures to store rain water, spring development, earthen bunds and constructing anicuts. There are altogether 16 artificial water holes inside BWS to quench the thirst of the wild animals during the lean period.

Severe water shortage is felt in the sanctuary during the months April and May. In BWS there are 62 water sources, out of which, 24 are perennial water holes, 5 seasonal, 16 artificial water sources, four are rivers, and 13 are streams. Details of these water sources are given in Appendix No-VIII. The list of MI tanks and anicuts in the sanctuary is given in Appendix - IX. Water sources in the sanctuary are shown in Map No.2.

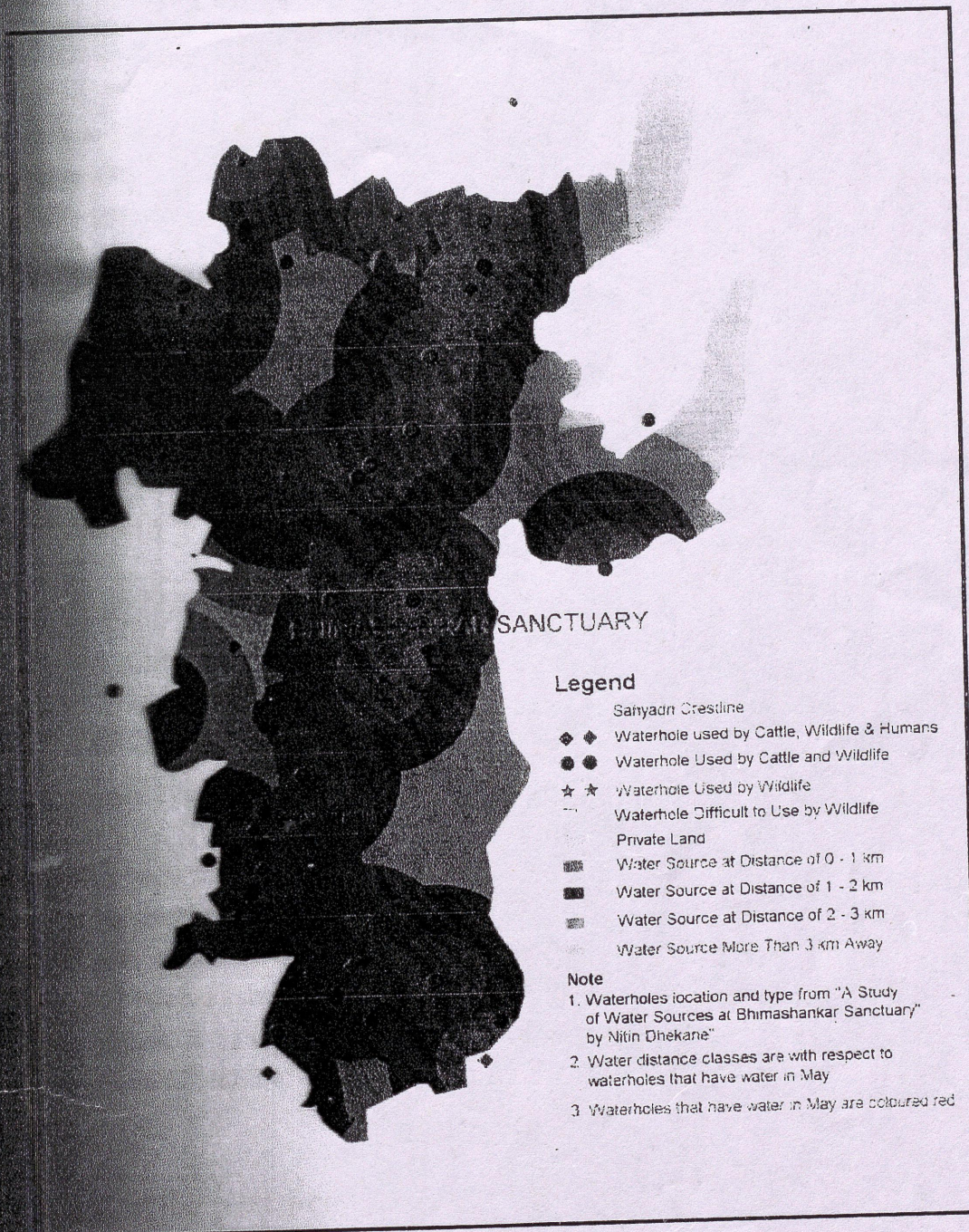
## 2.6 Range of Wildlife, Status Distribution and Habitat

### 2.6.1 Vegetation

Bhimashankar wildlife sanctuary is estimated to host about 1000 species of angiosperms, as seen at Khandala, a homoclimatic intensively explored area in the south (Santapau, 1967) Inventory of Bhimashankar flora by earlier workers as well

## Map No- 2

showing various Water Sources in the Bhimashankar Wildlife Sanctuary



As the present one is far from complete. However, wild woody plants alone records around 30(16%) species are not included in the 170 by Janardhanan (1966). This indicates that a thorough investigation of BWS is likely to add several species to the herbaceous flora as well.

The preliminary observation on the flora of BWS indicates that it consists of 107 families, 329 genera of 444 species with a ratio of 1:3.07:4.14.

The ten largest families in the decreasing order of number of genera and species have been listed. Interestingly the first three families are herbaceous. Out of 10 most dominant families 6 are exclusively herbaceous. However, the largest number of species is shown by a tree genus *Ficus* (8 spp.) followed by herbaceous genera- *Cyperus* (7 spp.), *Smithia* (5 spp.) *Dendrobium* (5 spp.) and *Clematis* (4 spp.) The list of 10 families is as follows-

Sr. No.	Name of the family	Genera	Species
1	<i>Poaceae</i>	22	30
2	<i>Fabaceae</i>	16	27
3	<i>Asteraceae</i>	19	25
4	<i>Euphorbiaceae</i>	17	20
5	<i>Acanthaceae</i>	17	19
6	<i>Rubiaceae</i>	12	19
7	<i>Orchidaceae</i>	9	15
8	<i>Lamiaceae</i>	9	13
9	<i>Rutaceae</i>	8	10
10	<i>Scrophulariaceae</i>	7	8

### 2.6.1.1 Endemic Flora

No plant has been so far identified as endemic to the BWS due to exacting climate, in contrast to southern Western Ghats with high degree of endemism, owing to a climate more conducive for evergreen vegetation. Although the evergreen vegetation of Maharashtra sector of Western Ghats, including BWS, is devoid of exclusive species, it has a considerable proportion of species confined to the whole of the Western Ghats i.e. wide spread endemics of the 'Malabar' biogeographic province.

An analysis of the wild woody plants shows that out of the total of 210 species occurring in the BWS, 28 are proven W. Ghats endemics, the list of plants found in BWS is enclosed at Appendix-X, out of these plants about 10-15 are doubtful Western Ghats endemics. However strength of endemics decreases from 34% to

18% from climax to secondary evergreen forest as revealed by their floristic composition, with continuous depletion, it reduces further in the scrub and thickets. Besides this quantitative change, qualitative alterations include replacement of delicate endemic species like *Meiogyne Pannosa*, *Syzygium phyllaeroides* etc. of the climax by hardy endemic like *Glochidion Sinicum*, *Meytenus rothiana*, etc. in the secondary vegetation.

Of the 26 species, 11 are endangered of which not more than a handful of species are known, 8 are vulnerable with a few known specimens and 7 are threatened which are rather rare of the 26 species, 16 are trees, 6 are shrubs and 4 are lianas.

#### 2.6.1.2 Vegetation types

Based on existing physiognomy and floristic, vegetation is divided into evergreen, semi-evergreen and deciduous. Within each type, several succession stages have been identified. The evergreen vegetation is confined to areas above 700 MSL and mainly along the crest of the Ghats, to the east of which it does not extend beyond 5 to 10 kms. The climax vegetation is observed only in three localities- Nhahniche ran to the west of the crest line and Gupt Bhima to the east represents low altitude evergreen type whereas that on the Forest Rest-house hill along the crest represents high elevation type. All these are extremely shady, composed almost wholly of sciophytes, the most characteristic being *Aglaia iawii*, *Beilschmeidia dalzellii*, *Cryptocarya wightiana*, *Dimorphocalyz lawinaus*, *Diospyros sylvatica*, *Aryaetes venusta*, *Ficus nervosa*, *Garcinia spicata*, *Mallotus stenanthus* etc.

In the disturbed areas, secondary forests occur which are dominated by *Memecylon umbellatum*, *Syzygium cumini*, *Olea dioica* and *Actinodaphne angustifolia*. In the relatively open forests, *Thelepaepale ixiocephala* forms the principal undergrowth.

Deciduous associates such as *Bridelia retusa*, *Ficus racemosa*, *Terminalia chebula* etc. are rather rare 900 mtr above MSL and hence, even the scrub and thickets exhibit evergreen physiognomy. Openness of thickets favours preponderance of heliophytes like *Colebrookia oppositaefolia*, *Carissa congesta*, *Crotalaria retusa*, *Leucas stelligera*, *Pogostemon bengalensis*, *Meytenus rothiana* etc. apart from *Memecylon umbellatum* upon development of tree stratum the vegetation assumes scrub woodland physiognomy. Structural repercussions of succession are remarkable. The climax forest are tall with three to four horizontal tiers of straight growing trees, often buttressed and having smooth bark and shining dark green thick foliage.

The secondary forests on the other hand, are having trees with fat trunks branching from the base, crooked branches and spreading canopy. Many have membranous leaves, thick and rough bark and lack buttresses. The vertical compression of succession stages could be attributed to ample space available for the trees emerging from scrub woodland for horizontal expansion. Perhaps exposure to severe winds and considerable site deterioration following deforestation, and continued biotic intervention also have decisive role in formation of stunted shola like forests.

In altitudes "between" (700-900) mtr above MSL and to the East of the crest line beyond 5 to 10 km. semi evergreen forests appear with a marked increase in the proportion of deciduous trees like *Bridelia retusa*, *Ficus racemosa* and *Terminalia chebula*. Species like *Memecylon umbellatum*, *Olea dioica*, and *Syzygium cumini* are common with the evergreen forests.

The potentialities of the semi evergreen forests of the west and those of the crest line are evergreen while those of the east are at best not exceeding secondary climax evergreen forests. The deciduous forests occur in areas 700 m below MSL, and occupy the western half of BWS. Little climax vegetation exists now in the zone. In other words climatic conditions here are less favorable for evergreen species to survive as compared to the plateau.

Existing forests are all deciduous with a predominance of *Terminalia crenulata* associated with *Lagerstromia lanceolata*. Evergreen species are few e.g. *Mangifera indica*. Large trees of *Holoptelia integrefolia* and *Pongamia pinnata* appear frequently along the streams. Considerable light infiltration through the open upper canopy allows development of heliophilic thelepaepale ixiocephala as the under storey. Scrub woodland and thickets do not differ considerably from each other as well as from the forests on account of similarity of microclimatic conditions unlike in the evergreen forests zone. Only structural differences help separate the physiognomies.

The evergreen zone potentialities are indicated by the exclusive presence of *Actinodaphne angustifolia*, the deciduous potentialities by the predominance of *Terminalia crenulata* and in general by *Terminalia* spp., *Albizia* spp. etc. The semi evergreen potentialities are indicated by replacement of characteristic species of both the above zones by *Bridelia retusa* and *Ficus racemosa*, which are not really exclusive. Presence of *Olea dioica* and *Memecylon umbellatum* helps to distinguish evergreen and even semi-evergreen communities however degraded they may be, from their deciduous counterparts. *Syzygium cumini*, a tree which occurs in all the

zones and physiognomies gains predominance in the semi-evergreen and evergreen forests. On the other hand ubiquitous species like *Terminalia bellirica*, *Lagerstromia lanceolata* etc. gain importance only in the deciduous zone. All the secondary formation in the evergreen, semi evergreen and deciduous zones, ranging from forests to thickets are dominated by *Thelepaepale ixiocephala* as the undergrowth. Shifting cultivation i.e. the practice of felling and burning of forests patches for temporary cultivation in a cyclic manner, was in vogue almost over the entire area, before reservation of the forests during British regime.

Even today this practice exists on private lands, therefore, very little undisturbed or virgin vegetation exists today, but for in the inaccessible or approachable but unexploitable sites. Most of the forests that we observe today are thus anthropogenic and do not reflect the true plant potentials of the land i.e. the climax vegetation. The presence of scrub thickets on the plateau and hilltops can be attributed to intensive shifting cultivation in the past.

The BWS is thus an important, large stretch of Tropical Moist Forests in northern Western Ghats with high habitat fragmentation. The BWS also hosts relic pockets of virgin evergreen forest in a delicate equilibrium. This forest is highly sensitive to human interference which with slight disturbance gets converted into poor secondary vegetation. The forest is rich in its endangered flora. Most of the vegetation of the BWS shows secondary formations which have resulted due to shifting cultivation. The area characteristically shows luminescent fungi during monsoons. Glowing fungus at night is truly amazing! The climax evergreen forest has highest conservation priority amongst all the habitats in the BWS. A few plantations were carried out by forest department in the sanctuary; the details of previous plantation are given in Appendix-XI. A few preservation plots were demarcated in the past. The details of these plots are given in the Appendix-XII.

### 2.6.1.3 Food

Panther is the major carnivore of the area. The panther hunts on common langur, bhekar, sambhar fawn, wild boar etc. No definite data is available regarding preference of food & eating habits of the herbivores. The giant squirrel or (shekroo in Marathi) feeds on terminal leaf buds, Flush leaves, semi mature leaves, immature fruit pulp, mature leaves of mango, karvi, and *Cassia glauca*. *Garcinia talboti*, *Memecylon umbellatum*, *Ficus glomerata*, *Syzigium cuminii*, etc. A few artificial salt licks were provided in the sanctuary, the location of artificial salt licks is given in Appendix-XIII.