

Forest as a Resource and Component of a Watershed, its Degradation and Conservation: A Case of Somb Drainage Basin

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Abstract: This paper explains about the present status of forest conditions in the study area, which is one of the most striking resources of present watershed. The methodology used to the study of forest is satellite image interpretation, intensive field investigations and secondary data collection from forest department. The forest in watershed area have mainly four types viz. - Siwaliks Chir-pine, Siwaliks Sal, Northern Dry Mixed Deciduous, and Dry Bamboo Brake. The present watershed occupies 167 km² (2004-2005) forest area. It is almost 32.62 percent of the total area of watershed, which is very high than the national level (19 percent) and approximately equal to the standard level of 33 percent area set under national forest policy, 1952. More than 80 percent of the hills and foothills are covered by forests in present watershed, which is much higher than the recommended figure of 60 percent in hills, as prescribed by National Forest Policy. However, it is a matter of concern that the quality, in some areas, is not good. Presently, increasing mismanagement as well as stealthily cutting of forest trees is also serious problem in the watershed. So, there is a need to maintain the quality and quantity of trees in the watershed

I. Introduction- Forest as a resource

Forests are ecologically as well as economically important for modern civilization. Forests, ‘all lands bearing a vegetational association dominated by trees of any size, exploited or not, capable of producing wood or other products, exerting an influence on climate or on the water regime or providing shelter for livestock and wildlife’, are the vulnerable renewable resources of the ‘biodiversity’ as the plants basically support the survival of each and every members of the biome. Forest help in balancing O² and CO² level in the atmosphere, regulate earth’s temperature regime and hydrological cycle. They increase local precipitation and water holding capacity of soil, thus preventing drought situation. Vegetation cover provided by forest, impeded the velocity of runoff on soil surface checks, soil erosion, silting and landslides, thus reducing the drought or flood. The litter derived from fallen leaves maintains fertility of soil by returning the nutrients. The forest resources are large in volume and diverse in character. On the other hand, the excess population pressure intensifies the demand of forest and forest products side by side. But unfortunately, these natural resources have been overlooked by the human kind, regarding the aspect of degrading trends of forest resources all over the world (Reddy, 2004 and Goswami, 2005).

The Word ‘FOREST’ can explain its value for life i.e.

F=Food, O=Oxygen (O²), R=Rainfall, E=Ecological Balance, S=Soil, T=Tree

Watershed and Forest

Watershed (drainage basin, catchment), basically, a geographically area that drains to a common point, which make it an ideal planning unit for conservation of all the vital resources of nature i.e. Water, Forest, and Soil. A watershed is most environmentally logical way to divide earth’s land into regions. In fact the entire earth surface comprises part of a watershed. Like the stream systems that they contain, watersheds are hierarchical and are conveniently subdivided into smaller sub-watersheds for local studies and management. At the same time, higher order watersheds of a large river system are subject to broad regional analysis.

Forested watersheds act as giant sponges, slowing down runoff, absorbing, and holding water that recharges spring, streams, and groundwater. Thus, they regulate the flow of water from mountain highlands to croplands and urban areas, they act as shields and reduce the amount of sediment washing into streams, lakes, and reservoirs by restricting soil erosion as the forest enrich soil-binding property (Anjaneyulu, A., 2004).

The types and qualities of vegetative cover in a watershed land influence runoff, infiltration rates, erosion and sediment production and the evapotranspiration. A dense cover of vegetation in watershed is the most powerful weapon for reducing erosion. Vegetative conditions are related to hydrological conditions.

Vegetative Conditions

- Heavily grazed or regularly burnt.
Small trees and brush are destroyed
- Grazed but not burnt, but these woods are not protected

Hydrologic Conditions

Poor
Fair

- Protected from grazing, Shrubs cover the soil Good

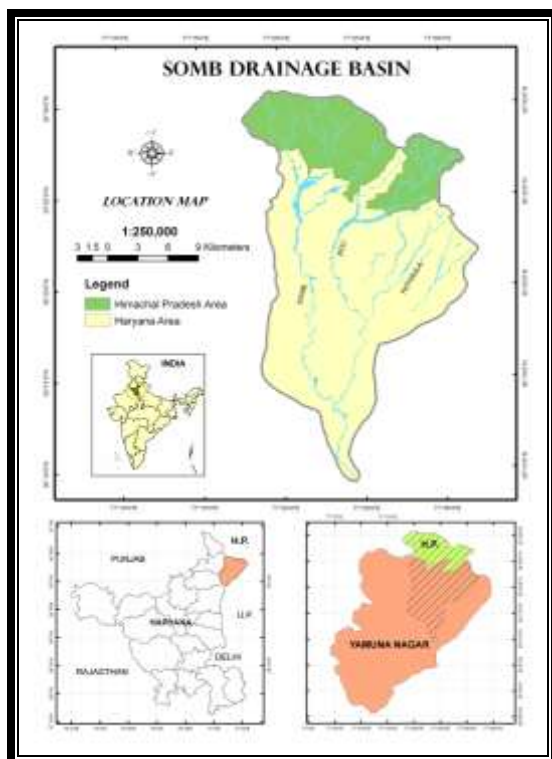
Forests occupy the most land in India after agriculture, and are an important natural resource for the country and its people. The present study of the watershed has a good tree cover. There are twenty-five reserved forests (RF) and fourteen protected forests (PF) in the watershed area. The hilly area of watershed have almost reserved forest and covered with many tree species.

The Study Area

The Somb nadi is a tributary of Yamuna river, arise from the outer slope of the lower part of Shiwaliks range in the District Sirmaur (Himachal Pradesh, India) and takes a southerly course, which drains in the plain land of District Yamunanagar (Haryana, India). The Pathrala (also known as Palasi Khadi) and Boli nadi are two major tributaries of Somb nadi. Somb nadi combined with Pathrala and Boli nadi discharge its water into Yamuna River from western side near Meharmajara village of District Yamunanagar after about a course of 40 kms. from its origin. The extension of Somb drainage basin lies between $77^{\circ}18'E$ to $77^{\circ}34'E$ longitude and $30^{\circ}9'N$ to $30^{\circ}29'N$ latitude. The total calculated area of Somb drainage basin is 492 kms². Map-1 shows the location of Somb drainage basin. Satellite imagery has been also prepared of Somb drainage basin (Image-1).

Forest cover in Somb Drainage Basin

The present watershed occupies 167.33 km² (2004-2005) forest area. It is almost 32.72 percent of the total area of watershed, which is very high than the national level (19 percent) and approximately equal to the standard level of 33 percent area set under national forest policy, 1952. More then 80 percent of the hills and foothills are covered by forests in present watershed, which is much higher than the recommended figure of 60 percent in hills, as prescribed by National Forest Policy.



Map-1

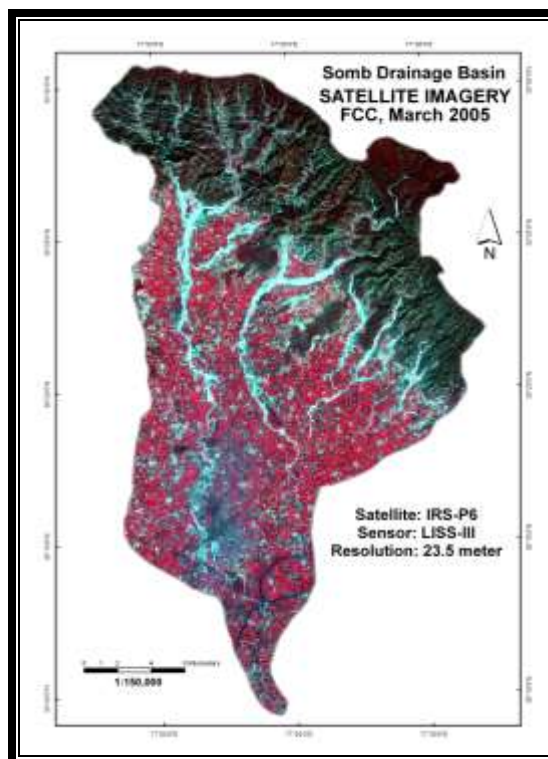


Image-1

The forest can be classified in two categories-

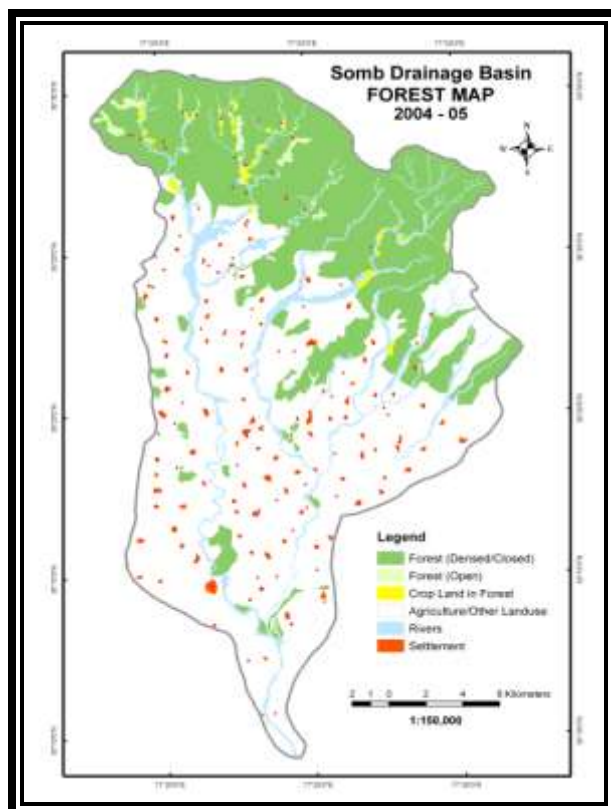
- a) On the basis of vegetation curve
- b) On the basis of Administration

(a) On the Basis of Vegetation Curve

On the basis of vegetation curve, Forests are further classified into three groups. Dense forest or closed forest, Open forest, and Crop area under forest. This has been studied through image interpretation of present watershed (Table-1, Map-2 & Fig.-1).

Dense/Closed Forest

The forested areas having more than 40 percent tree density are classified as dense forest (Anjaneyulu, Y. 2004). It is estimated that more than 96 percent (161 km²) of the total forest area is under dense vegetation cover, which constitutes 32.72 percent area of watershed.



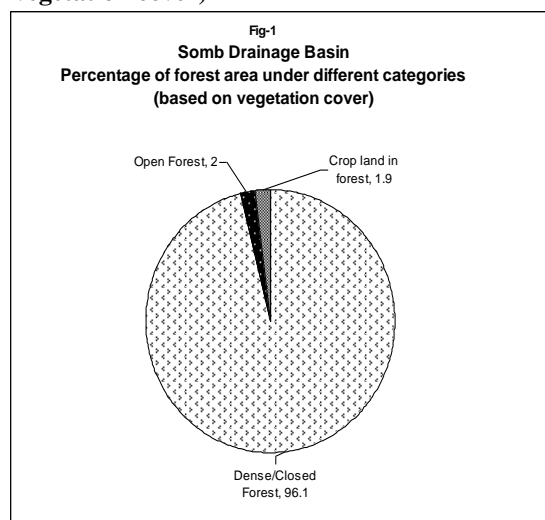
Map- 2

Open forest

The area having crown density between 10 to 40 percent are included into this group (Anjaneyulu, Y. 2004). It occupies just 3.2 sq. km (two per cent of forest area), which is 0.65 per cent of total geographical area of the watershed.

Table- 1
Somb Drainage Basin
Forest Cover (on the basis of vegetation cover)

Forest	Area (Km ²)	Percentage of Forest area	Percentage of watershed area
Dense/Closed Forest	161.02	96.22	32.72
Open Forest	3.20	1.91	0.65
Crop Land In Forest	3.11	1.85	0.63
Total	167.33	99.9 (100)	34.00



Source- Based on analysis of satellite image, March, 2005

Cropland under forest

In forest area of watershed, some areas have been used for agriculture purposes, which is just 3.1 km² of the total forestland.

(b) On the Basis of Administration

On the basis of administration, Forest department has divided the forests into three groups i.e. Reserved Forest, Protected Forest, and Unclassified forest. According to Forest department of Sirmaur, Himachal Pradesh and Yamunanagar, Haryana, the watershed has 29 Reserved Forest [17 Sirmaur (Himachal Pradesh) and 12 Yamunanagar (Haryana)], 16 Protected forest [(all in Yamunanagar (Haryana))] and one is unclassified forest situated in Yamunanagar, Haryana (Table- 2, Fig.-2 & 3).

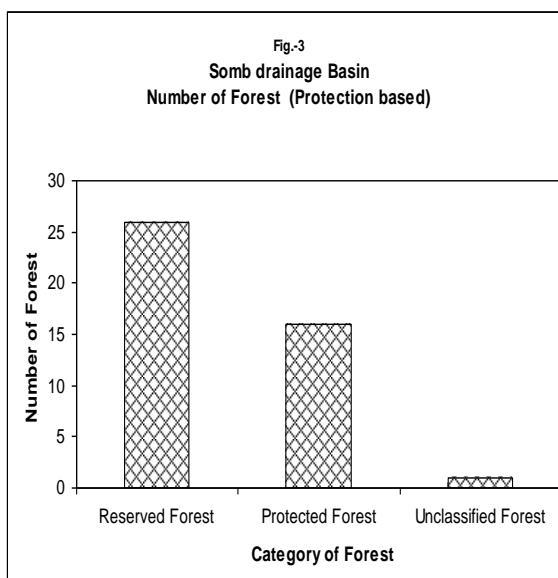
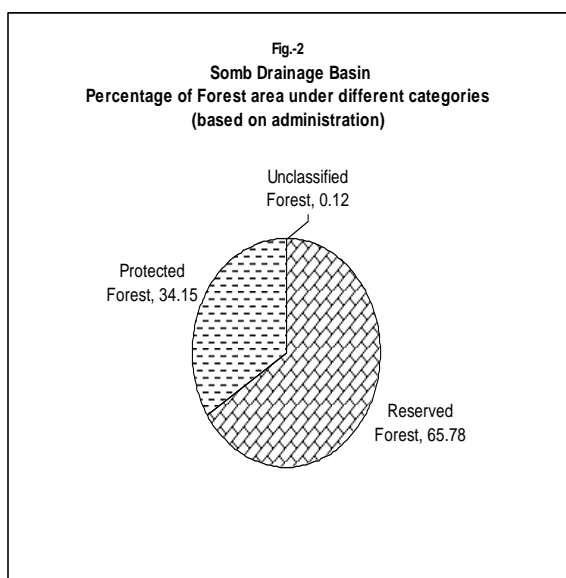
Types of forest

The forests of this region are of great importance for its economy as well as for maintaining the ecological balance of soil, water, flora, and fauna. The transitional location of the watershed between the outer Himalayas and the Yamuna upland plain has enriched it with a topographical variety.

Table-2
Somb Drainage Basin
Forest Cover (on the basis of administration)

Category	Number of Forests	Area (km ²)	Percentage of total forest area	Percentage of total watershed area
Reserved Forest	29	105.58	65.78	21.45
Protected Forest	16	54.71	34.15	11.12
Unclassified Forest	1	0.20	0.12	0.04
Total	46	160.5	100.00	32.61

Source- DFO, Forest Department, Sirmaur (Himachal Pradesh) & DFO, Forest Department, Yamunanagar, (Haryana)



The Scrubland

Scrubland is an area, having ten percent tree density with more than fifty percent scrubs. These areas are found in patches and vary in size with irregular and discontinuous shape. Land under scrub occupies an area of about 34.5 km², which is more than seven per cent of watershed area. Remaining area of wasteland i.e. area under scrub-less, is just one square kilometre. This is the area of rocks and stone waste or kankar, which are deposited by streams on their banks during rainy or flood season (Map-3).

Utilization of Forest Resources in Somb Drainage Basin

The main requirements of the people in watershed area, which are gained from the forest, are the following:

- ✓ Building timber and small timber for agricultural implements,
- ✓ Fire wood
- ✓ Leaves of trees and grass for fodder
- ✓ Grazing of animals

Near watershed area, Yamunanagar-Jagadhri (Haryana), Nahan (Sirmaur, Himachal Pradesh), Saharanpur (Uttarpradesh) and Dhera Dun (Uttarakhand) are main market centers, where the demand of forests resources- mainly timber, is very high. Yamunanagar-Jagadhri is one of the biggest markets in India. It is well connected by rail, road, or both networks with other important market centers. The forest-based industries at Yamunanagar are paper mill, sawmills, hard board, plywood, factories and straw board factories, sugar mills, packing case industries and furniture making. The timber comes from the forest of foothills of Shiwalik ranges.

Degradation of Forest Resource

There are mainly two factors causing degradation of forest cover in the watershed i.e. –natural factors and biotic factors

(a) Natural Factor

1. **Frost-** Frost is quite severe in the area and causes some damage to *sal* regeneration in the exposed areas. In bad years, it causes serious damage to *sal* saplings and poles by killing off their leading shoots and causing branchlessness and a bushy form at the top. The intensity of frost is more severe in low-lying areas, where there is no crop. Most of the frost occurs in December to late January, which is more severe and causes a lot of damage to *sal* crop.
2. **Drought-** Drought conditions affect the young forest plantations and the establishment of natural *Sal* regeneration. Although the area receives good rainfall, but most of it occurs during the monsoon, prior to which the hot summer takes its toll. Drought conditions persist also in the months of October to November.
3. **Storms-** Except in summer, winds is not particularly severe in this area. However, when strong winds follow heavy and continuous rainfall, some trees are uprooted while in others branches break and leaning of some trees also occurs. The dominant trees are sometimes affected by lightening, which splits the tree and kills it.
4. **Floods and Erosion-** Every year some damage is done to the forest during the monsoons, when the seasonal torrents extend their beds or change their course causing uprooting of the trees by eroding the soil. The flooding of the low-laying areas, which are not well drained, retards the progress of young plants. The erosion is further accelerated due to fires and grazing.
5. **Plants-** Evergreen weeds like *lantana* have invaded the forest area spreading quickly in any opening, forming almost impenetrable thickets. It is harmful for the natural regeneration of the forest species mainly *sal*. The climbers are generally heavy in the watershed area, *Maljhan* and *Gauj*, the two most common climbers, causes malformation of young trees and reduce the timber quality.

(b) Biotic Factor

1. **Man-** Man is the greatest enemy of the forest. Apart from the intentional forest cutting- and thefts of the forest products by the people, severe damage to the forest is caused by lopping of valuable species like *sain*, *sandan*, *chal*, *padfal*, *khair* etc. This practice causes injury to the trees, inviting insects and fungus. It also leads to slow extinction of the species, as there is no natural regeneration. Encroachment of the forest areas by influential patronized villagers, coupled with short-sighted gains of forest staff and their lack of security apart from the construction of forest roads and transfer of land to other department for various development works, also lead to the shrink in forest area.

Increasing population growth in the watershed area has put enormous pressure on forestland. People cut the vegetation from forest areas and convert them in agricultural land (Plate- 1 A&B).

PLATE- 1 A



Cutting and extraction of wood from forest in watershed area

2. Animals- Both domestic animals as well as wild damage the forest vegetations through grazing. Grazing by domestic animals is extremely heavy all over the watershed area and the pressure is increasing from year to year resulting in soil erosion. The grazing limit far exceeds the carrying capacity of the forest. Wild animal like *Nilgai*, *Pigs*, *Porcupines*, *Sambhar*, *Chital*, *Kakar* and other animals cause some damage to young plantations. It is nowhere severe in the watershed. In arable area, they also damage the crops. Insects also damage the vegetation of forest to some extent. Many trees in the watershed have been infected with fungal attack, which has resulted in poor hygiene of the forest.

3. Fires- Fires in the watershed generally break out during the period of March to the advent of the monsoons. The summer being exceptionally hot and dry adds to the misery. Most of the fire in the watershed results due to the mischief of the local villagers, who set fire for getting good grass covers for grazing after rain.

Conservation of Forest Resources

Renewable natural resources, especially forests, are conserved for three major sets of purposes:

- The maintenance of ecological processes and life support system
- The sustained use of the resources for consumptive and social benefits
- The conservation of biodiversity units own right for ethical, moral, aesthetic evolutionary resource.

Following methods should be carried out to conserve the vegetation cover in the watershed area-

- a. Forest cutting is a big problem in the watershed. Degraded forest slopes mainly in the hilly areas accelerate the process of soil erosion. So afforestation programmes should be initiated to stop further soil erosion in the watershed.
- b. The hills and foothills of the watershed face serve erosion hazards and inadequate vegetative cover. These areas must be closed during the rainy season and at the time of plantation to grazing and lopping so that natural vegetation cover gets change to establish. However, grass cutting after rainy season should be permitted as a preventive measure against fire hazards and to satisfy the full-fill the demands of the people. There should be complete prohibition on upslope encroachments into forest for cultivation, horticulture, grazing etc.
- c. Sowing and planting of suitable species should be carried out intensively in a scientific manner for providing vegetative cover in the areas.
- d. Forest conservation committee should be establish at the village level which involve the local people of that area and efforts should be done to educate the villagers about the importance of vegetation, soil and water of our present and future.
- e. Several eroded land where top soil completely removed, existing as land without scrub, may be recommended in the isolated pediments for plantation of Eucalyptus.
- f. In gullied areas check damming, gully plugging and other soil conservation works should be carried out to protect the area from erosion hazards.
- g. Unstable slopes and landslips should be stabilized by planting plants.
- h. In torrents Cho-training works should be done.
- i. Staggered contour trenches should be dug out in areas for sediment control and to reduce run off and peak discharge.

- j. On slopes fodder tree (like Chhal, Khirak etc), Economic specially tree (like Khair etc.), Fodder grass (like Dhaulu etc.), and industrial grass (like Bhabbar) must be planted and effective vegetation cover should be provided on the slopes.
- k. Those areas, which are in, close vicinity of the village. These areas have to be developed in such a way that the hills remain covered with grasses and trees to induce adequate water for supplemental irrigation to the poor farmers. Side by side, intensive planting of Bhabbar grass should be developed to provide raw material for rope making to the poor people. This should be protecting the hilly area.

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