



Forest Fire and Biodiversity Loss in India: A Manager's Perspective.

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ABSTRACT

The nearly all widespread threat in forests is forests fire. Forests fires are seeing that old as the forests themselves. They pretend a threat not merely to the forest wealth other than also to the whole management to fauna and flora gravely worrying the biodiversity and the ecology and environment of a region. There is shrewd corroboration to proposition thus as to fire regimes are altering in frequent parts of the world. People, somewhat than natural causes, are more and more in charge intended for stating fires and human actions are changing the probable of fires to motive grave impacts on the comfort of imperfect human communities and biological diversity. Forest fire is incredibly frequent in each and every one the ecosystems in addition to plays an imperative function in ecosystem dynamics, biodiversity, soil and microbes. Estimates optional that fires unfavorably impacted seeing that much as 25 million hectares of forest worldwide. According to Forest Survey of India the authentic forest cover of India is 19.27% of the geographic area, consequent to 63.3 million ha. Only 38 million ha of forests are glowing stocked (crown density above 40%). This resource has to convene the insist of a population of 950 million people and in the region of 450 million cattle, seeing that such, country has to needs of 16% of the world's population from 1% of the earth forest resources. The same forest has as well to provide intended for the 19% of the world cattle population. Tropical rain forests, in demanding, which were on one occasion contemplation to be opposed to fires, are at the present experiencing large-scale fires due to unsustainable management practices. Due to political and economic crises, boreal forests of Russia are experiencing a number of the nastiest fires in decades. According to expert and recent estimates from satellite imagery bring to a close that 7.2 million hectares of forestland (distinct as state Forest Land and might comprise unfrosted areas) burned in the Asian part of Russia, of which 1 million hectares were coronet fires (*Shvidenko and Goldammer, 2001*). In 1987, in North-eastern China 1.3 million hectares were shattered by means of a single fire (*Di and ERide, 1990*). Forest fires are a most important source of dreadful conditions of India's forests. At the same time as statistical data on top of fire loss are feeble, it is predictable that the proportion of forest areas prone to forest fires yearly ranges from 35% in a number of states to wrap 90% in supplementary. In relation to 90% of the forest fires in India are shaped through humans. The usual season in India is from the month of February to mid June. India witnessed the nearly everyone stern forest fires in the new time during the summer of 1995 in hills of UP and HP. The fire were very severe and attracted the attention of whole nation. An area of 677,700 ha was affected by means of fires. India's forests are beneath a steady threat of severe biotic pressures caused by rapidly increasing human and cattle population, fuel wood and industrial demands, encroachments, forest fires and an assortment of additional factors. Shifting cultivation is one more put into practice (*R.K.Luna, 2007*) accountable for loss of tree cover by means of wider ramifications. Even today an estimated 2.6 million populace frequently tribals (Karbi Anglong, Assam, Meghalaya etc) are involved in the region of 10 million ha of forest area beneath this put into practice. Forest fires are a significant source of emitted carbon, which exacerbates global warming as well as being an unique carbon sink. Recurrent fires in the Himalayan region of Uttarakhand in the Indian Himalayas have been responsible for forest worsening. It is truthful that common fires on great scales motive air pollution, ruin eminence of stream water, threaten biodiversity and mess up the aesthetics of an area, other than fires play an vital role in forest ecosystem dynamics. The present appraisal deals the collision of forest fire on species dynamics, biodiversity, soil nutrient and microbial status to direct a fire since a tool of forest running and manage of nutrient, insect and disease. Stipulation fire is managed shrewdly it be able to be alive used as the cheapest resources of forest running. For this reason dissimilar fire uniqueness are assessed together with their interrelationship by means of forest flora.

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1. Introduction

Fire is a natural procedure so as to has played a major role in shaping our environment in addition to maintaining biodiversity wide-reaching. Fire's remuneration and impacts are widespread; the preponderance of the world's terrestrial habitats depend on top of fire intended for ecological sustainability. Fire repeatedly determines the allocation of habitats, carbon in addition to nutrient fluxes, along with the water withholding properties of soils. In habitats habituated to fire and reliant on it for environmental health, fire keeping out time and again results in abridged biodiversity and augmented vegetation density, repeatedly growing risks of catastrophic fire in excess of instance. Fire have global social, economic, health and ecological significance. According to the Food and Agriculture association almost 10 million hectares within Indonesia burned, estimate awake to US\$10 billion and pressure the health of 75 million people. Fire has extended been essential fraction of the forest environmental and has played an imperative function in shaping the flora and fauna. A few may be what's more useful or disadvantageous to individuals of a meticulous species other than the consequence of a single fire is not seeing that environmentally noteworthy because a modify to the fire regime (Smith,1995). A study was carried out (Srivastava,1989) during the Sixth Five year Plan (1980-85) 1785 fires were reported, touching an area of 5.7 million ha, or an annual average of some 1.14 million ha. Inventories demeanor by the FSI show so as to on standard 55% of forest region in India is exaggerated through fire and 78% by means of grazing. Consequently, modest renaissance take place in 72% of forested area (MOEF,1997). The annual losses as of forest fires in India intended for the whole country have been reasonably predictable at Rs. 440 cores (US\$107 million). For the duration of the year 1995 Uttarakhand and Himachal Pradesh an vicinity of 677,700 ha was pretentious by means of fires. Forest fires happen in three principal forms as surface fire, Crown fire and Ground fire depending on top of their earnings (Narendran, 2001) of extend in addition to their location to the position. Surface fires burn surface waste, supplementary wobbly wreckage on top of the forest floor, in addition to small vegetation. Crown fires go forward from side to side the tops of trees or shrubs supplementary or defeat separately of the exterior fire by means of the best ever spreading of every one of forest fires. Ground fires put away the organic fabric underneath the surface litter of the forest ground. Fire is an imperative tool used by humans to form the land, producing educational landscapes they are able to also hold up ecological health. When human events reason as well much, too little, or the wrong type of fire, it can threaten our scenery by means of releasing intolerable levels of greenhouse gases keen on the atmosphere, as long as alleyway for damaging invasive species, changing landscape hydrology,

make worse local and regional air quality, furthermore presenting a direct and time and again augmented jeopardy to human environment. The Himalayan forests, above all, Garhwal Himalayas have been burning frequently during the last few summers, by means of massive beating of plant life wrap of that region. A most important fire insolvent out in Bandipur Tiger Reserve in Karnataka surrounded by the second week of March 2015 which shattered more than 320 hectares of forest cover (Shrivastava, K S, 2014) in the reserve. Bamboo clumps, trees and ground vegetation were every one misplaced in five forest ranges, through the critical tiger habitat. In India a large fraction of India's deciduous as well as semi- deciduous forests is characterized by undo and frequently burned stands. To lessen water strain the deciduous trees lean-to their leaves for the duration of the dry season. These fuels as one by means of the grassland layer, agree to the development of low and medium concentration exterior fires approximately each year. Numerous unbolt forests are smooth exaggerated through fire two times or three times per year. Forest fire is frequently an anthropogenic observable fact (Saha and Howe, 2001) which burns precious flora and fauna in addition to now and then as well involves villages and structures. Every year, the world faces tremendous wild fires, which have an effect on million hectares of forest most important to effects on biodiversity, ecosystem performance and landscape constancy. The higher concentration fire results hooked on whole loss of soil organic matter as well as volatilization of nitrogen, phosphorus and potassium other than extremely high temperature is requisite designed for absolute on fire of Mn, Mg, Cu in addition to extra micronutrients. The soil microorganisms are mostly (<http://artcle.sapub.org/10.5923.j.ijaf.20150502.01.htm>) responsive towards far above the ground warmth as well as typically exaggerated. The occurrence of forest fire diminishes the actinomycetes, fungal inhabitants in addition to arbuscular mycorrhizal fungi, at the same time as augment the bacterial prosperity. Mouthful of air of burn as of a wildfire able to be a health peril. Wildfire smoke is first and foremost calm of carbon dioxide, water vapor, particulate matter, organic chemicals, nitrogen oxides as well as extra compounds. The standard health apprehension is the gulp of air of particulate substance and carbon monoxide. Forest fires occur in almost all types of ecosystem, some of these (Kraus, D. et al.,2007) ecosystems are extremely sensitive to fire, but without subsequent ignition of wildfires, they can recover. Fire influences the preponderance of Australian worldly ecosystems, and a lot of endemic Australian species are in danger through unsuitable fire command. In Australia, there were major fires in the south-east in 2002 and 2003. Ground fires strength reduce the expansion of the grasses, herb and shrubs, which imprison reason in soil erosion as well as also make easy encroachments. Forest Managers have to get a holistic, long

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expression landscape stage vision, in addition to demonstrate modify in itself is predictable. Substantial growth is within reach, other than requires association between ecologists and forest managers. Climate unpredictability is predictable to augment crossways the globe (IPCC WGII,2007) and this will lead to boost in temperature the length of by means of long-drawn-out droughts as well as less precipitation creation the forests added vulnerable to forest fires.

2. Objective of Forest Fire Management

- Forest Fire as a Management tool for control burning.
- For Maintenance of Fire Lines.
- For detection and Fire fighting strategies.
- Involving local people for fighting fire.
- Fire for forage production is grasslands for wild ungulates / herbivores.

3. Causes of Forest Fire

Fires might be caused by means of a numeral of factors within a agreed situation. Mostly they are unswervingly connected to the socio-economic, ethnological and artistic relatives of the society, since man has used the fire intended for times immemorial.

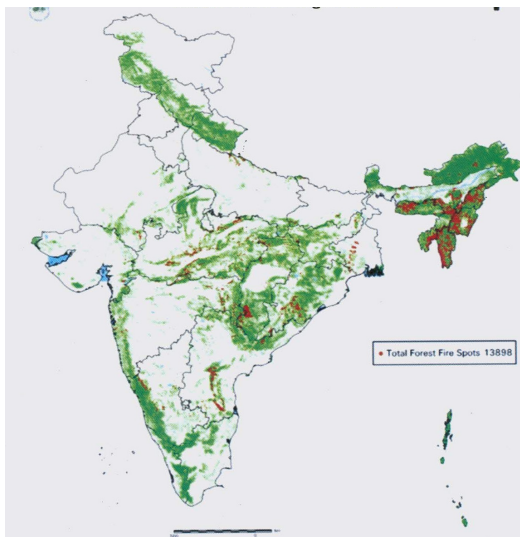


Figure 1: Forest Fires During 2010 – 11.

Source: FSI

Communities in excess of the world at the present in addition make use of the fire to direct pastures, liberate agricultural land from the forests and unwanted enlargement. In many parts of the world, burden of reforestation programmes on top of the people and reservation of forest areas in the direction of restrain their rights for widespread make use of have been accountable intended for a lot of fires. The most common reason of wildfires varies all the way through the world. In Canada along with northwest China, designed for instance, lightning is the most important starting place of detonation. Presently the pattern of forest fire within the country which can be used intended for preparing national stage strategy (FSI,2011) for near the beginning warning and burnt area evaluation. A total of 13,898 fire incidences were reported by FSI to the states in the year 2010-11. Forest fire through causes as well as physical circumstances (wind momentum, fuel sort, etc.) duration otherwise extent, uncovering sources, costs and types of repression technique in addition to

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harm continued, and consequently resting on. Forest fires are caused by Natural causes as well as Manmade causes.

Natural Causes:

Many forest fires start on from natural causes such given that lighting which place trees on top of fire. On the other hand, rain extinguishes such fires devoid of causing a great deal smash up. High Fires atmospheric temperatures in addition to aridness (near to the ground dampness) present constructive condition intended for a fire to create. Natural fires are for the most part connected in the direction of climate situation such seeing that remarkably extended dry-spells, far above the ground temperature in addition to lightning. Sometimes natural fires are caused owing to falling of dry leaves on top of electric lines, rising and falling shingle in addition to rubbing of bamboo culms by means of all other. On a yearly basis within the USA, classically supplementary than six times the numeral of wildfires are caused by means of human means such seeing that (<https://en.wikipedia.org/wiki/wildlife>) campfires along with prohibited agriculture burns than through natural means. In 2010, roughly 1.4 million acres were burned by means of human -caused wildfires, in addition to in excess of 2 million acres were burned as a result of as expected caused wildfires.

Man made causes:

Globally, 95% of each and every one fires are caused through various human actions (*FAO, 2006*). Since the crack of dawn of history, positively, man had been the principal agent causing fire initial for clearing jungles intended for agriculture and pastoral husbandry, after that for hunting wild animals in addition to as a means of humanizing and defrayal superfluous increase and now for combustible or inadvertent reasons. Fire might be caused by the impact of human population as well as the process of running these forest as well. Fires may be put by means of man and his agents moreover intentionally or owing in the direction of faulty management. Fire is caused when a foundation of fire in the vein of bare blaze, cigarette otherwise bidi, emotional flicker or several starting place of explosion comes into get in touch with ignitable fabric. Traditionally Indian forest have been affected by means of fires. The menace has been provoked by way of growing human and cattle population as well as the resulting augment in insist for woodland foodstuffs as a result of individuals and communities. Environmental (which are further than manage) causes are for the most part connected in the direction of climatic circumstances such seeing that temperature, blustery weather momentum in addition to course, level of dampness inside soil along with atmosphere and period of dried out spells. Other natural causes ([http://agritech.tnau.ac.in/agriculture/agri_Major Areas:: Disaster Management:: Forest Fire](http://agritech.tnau.ac.in/agriculture/agri_Major_Areas::Disaster_Management::Forest_Fire)) are the resistance of bamboos influential owing to far above the ground blustery weather rapidity and rolling stones that product in sparks scenery rotten fires in exceedingly inflammable leaf litter on the forest floor. Human related (which are convenient) causes result from human movement as well as methods of forest management. These be able to intentional or Unintentional.

Threatened Forests



An earth put in danger - forces in the rear the forest losses

source:www.manganabay.com

Figure: Natural Forest Degradation

According to FSI (*ISFR, 2011*) geo-coordinates of the forest fire point locations can be found out as well as fire detection has an accuracy of in excess of 95% prone area in the country and as well the critical point in time period of the incidence for each state and UTs.

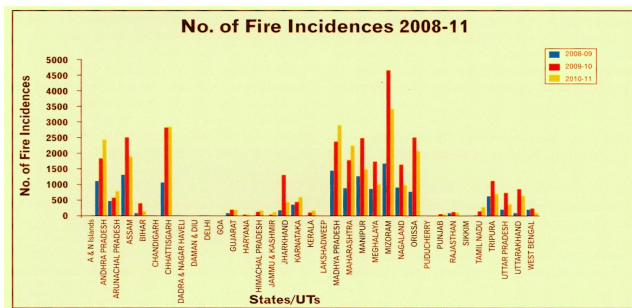


Figure: Number of Fire Incidences 2008 – 11

Source: FSI

- Graziers and gatherers of a variety of forest foodstuffs initial diminutive fires to get hold of good grazing grass as well as to facilities congregation of minor forest create like flowers *Madhuca indica* and leaves of *Diospyros melanoxylon*.
- The centuries old put into practice of shifting cultivation (in particular in the North-Eastern region of India as well as in parts of the State of Orissa and Andhra Pradesh).
- The use of fires through villagers to ward rancid wild animals.
- Fires lit deliberately through people affectionate in the region of forests for leisure.
- Fires in progress inadvertently as a result of not careful visitors to forests who throw away cigarette butts.

The causes of forest fire have been escalating quickly. The crisis has been accentuated by the rising human in addition to cattle population. People go into forests increasingly additional regularly to graze cattle, bring together fuel wood, timber in addition to additional minor forest create. It has been predictable that 90% of forest fires in India are man-made.

4. Classification of Forest Fire

Man over and over again encounters the occurrence of burning in the form of bonfires, total fire clearings in agricultural land, throughout taking absent of timber from felling areas, entity fires, etc. a forest fire (Artsybashev, 1983) is several unforeseen or unfettered ignition of vegetation dispersal in excess of a forest neighborhood. By the side of

present, the put into practice of forest fire control depends on the classification pattern, the source of which is unspecified to be a meticulous cluster of combustibles ablaze in the fire. Wildfires take place when each and every one of the essential rudiments of a fire triangle approach as one in a vulnerable area: an detonation foundation is brought in get in touch by means of with flammable fabric such as vegetation, that is subjected to adequate heat as well as has an sufficient provide of oxygen from the ambient air. A high moisture satisfied additional often than not prevents ignition and slows propagation, because high temperatures are required to evaporate any water within the material and heat the material to its fire point. Dense forests usually provide more shade, resulting in lower ambient temperatures and greater humidity, and are therefore less susceptible to wildfires. Less dense fabric such since grasses and leaves are easier to ignite because they hold less water than denser material such as branches and trunks. Plants endlessly lose water by evapotranspiration, but water loss is usually balanced by water absorbed from the soil, humidity, or rain. When this balance not maintained, plants dry elsewhere as well as are therefore supplementary flammable, over and over again a effect of droughts. A wildfire facade is the piece sustaining incessant blazing combustion, where unburned fabric meets vigorous flames, or the smoldering changeover between unburned as well as burned stuff. Protected areas within Nepal as well as northern India have been pretentious through forest fires, by means of at slightest solitary anguish enormous wildlife losses. According to expert almost 70% of Nepal's Bardiya National Park has been obsessive by means of fire in the past a small number of days. Conservationists, utter forests in mountain regions are mainly susceptible since the overriding tree species are conifers, whose resins create them exceedingly combustible. During the year 2009, more than one dozen soldiers mislaid their lives at the same time as annoying to hold fire in a mountain region. large wildfires might have an effect on air currents within their instantaneous vicinities through the heap consequence: air rises seeing that it is animated, in addition to huge wildfires make influential updrafts that will illustrate in new-fangled, cooler air from adjacent areas within thermal columns.

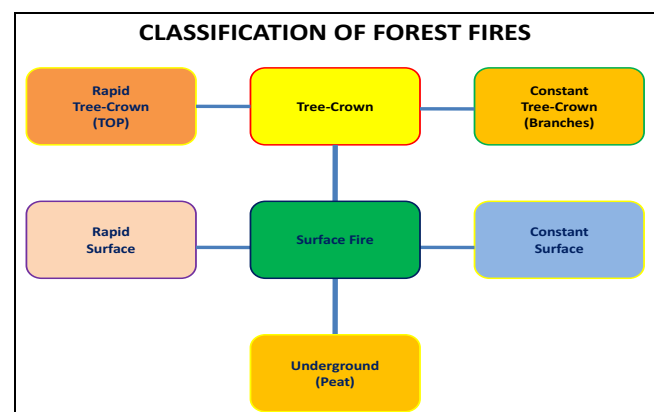


Figure: Classification pattern of forest fires

Source: Luna, R.K.

According to this prototype, all forest fires are classified into three categories:

- Natural or proscribed forest fire

- Forest fires caused by means of warmth generated within the litter as well as supplementary biomes into summer all the way through negligence of people (human abandon)
- Forest fires on purpose caused through local inhabitants

5. Types of Forest Fire

There are two types of forest fires.

- Ground fire
- Crown fire

Ground fires:

A speedy ground fire is characterized by means of a rapid go forward of the perimeter, at what time dehydrated grassland, lichens, pinnacle humus, etc be on fire out of bed. Such fires over and over again take place within mechanism, for the most part in grass roofed forests, in addition to in summer in unfortunate compactness softwood forests. A swift ground fires does not more often than not harm occupied full-fledged trees, other than it repeatedly poses a danger of living being distorted hooked on a crown fire in forest plantations as well as in the middle of softwood saplings. In a invariable ground fire, burning occurs of the soil cover up, stumps and deadwood.



Figure: Ground fire in Kaziranga National Park, Assam India.

Undergrowth and bushes perish, the lower parts of costume in addition to starting place sticking elsewhere of the ground are in excess of and greater than another time hurt. Proscribed burning of grasslands is a deep-rooted put into practice in Kaziranga National park.

Fire helps in the upholding of grasslands in the following ways:

- Apart from arresting sequence from grassland to forest, fire is supposed to augment efficiency of grasses
- On fire helps in seeing that long as eminent dominance rummage contained by grassland which is favorite by herbivores.
- It prevents sequence as of shorter *Imperata cylindrica* conquered swards to taller grassland communities subjugated by means of grown-up stands of *Saccharum arundinaceum*, *S. narenga* in adding together to supplementary species in addition to forest species that are fewer preferential by necessitate grassland ungulates.
- Burning as well enhances visibility that facilitates anti poaching observation, in particular in tall grass areas. Within a

invariable ground fire, the perimeter advances gradually emitting wide be on fire analytic of the heterogeneous quality of combustion.

Crown fires:

The further category of forest fire is a crown fire in which the crown of trees along with shrubs burn, over and over again continued by means of a surface fire. A crown fire is above all extremely hazardous within a coniferous forest since resinous stuff specific rotten burning log burn angrily. On hill slopes, downhill, it spreads awake speedy as animated air contiguous in the direction of a splatter tends to pour up and about the incline spreading blaze all along with it. If the fire starts ascending, in attendance is fewer probability of it dispersal downwards. Invariable crown, as well as stable ground fires over and over again happen in the second half of summer in windless weather conditions subsequent to long-drawn-out drought. They are trait of middle-aged pine in addition to larch forests. On the other hand, if within its course, a fire encounters a small portion of hardwood, its extend is not halted and, usually, the hardwood stands are inspired in the fire.



Figure: The moment of severe crown fire

6. Effect of Forest Fire on Biodiversity

Fire during the natural environment has a thoughtful consequence on the wildlife of an area. Fire is termed as one of the risky foes of the forests, which does inestimable damage to forest enlargement in our country. Fire determines the floristic composition of an area by selecting species, which will continue to occupy a site. Environmental changes such seeing that folks caused by means of fire, flooding, deforestation, or a forestation settle on the depiction as well as profusion of convinced animal species. Uncontrolled fires have an effect on forest resources within a assortment of habits. Renaissance is killed or dies reverse, in that way delaying the business of a new-fangled crop and extending the rotary motion. Fire are reported to harm gravely the regeneration of imperative (Maithani, Bhauguna and Lal,1986) tree species in Sal forest. A species can be detached condition fire occurs as well over and over again, too early, or behind schedule in its existence sequence. For occurrence, a non-sprouting species might be alive misplaced stipulation fire occurs previous to seed has been shaped, or if fire occurs subsequent to the species has died and seed pool is occupied. Grazing as well as fire are associated on the way to plant invasions. Gaps shaped by high-intensity fires are predominantly vulnerable to invasion by exotic species e.g. *Imperata cylindrica* rapidly recovers subsequent to fire and might act in response by means of an augment in wrap. Invasive species depletes the biodiversity

on top and vicinity from beginning to end allelopathic alleyway. In tropical Africa there are at the present more than two hectares of savanna intended for each hectare of congested forest in addition to sustainable make use of this savanna is of dangerous significance anywhere it borders (Anon, 1984) on Sahelian zones. Proper fire be in charge of is indispensable for such sustainable use.

EFFECTS OF INVASIVE WEEDS



Figure: Invasive species in Kaziranga National Park, Assam

Fires generate a assortment of renaissance environments appropriate for migration of new species. Augmented heterogeneity as a result leads to greater than before species assortment. At what time turbulence are transitional in occurrence in addition to strength, the resultant environment provides opportunities for both occupant as well as colonizing species, in that way maximizing biological diversity. Fires affects wildlife within a assortment habits. Seeing that the work of art of vegetation changes, it brings thoughtful changes in the wildlife populations owing to changes within recurring accessibility of scavenge, superiority of rummage, water superiority changes etc. The wildlife populations might wander from the scavenge shortage areas to forage excess areas. The belongings of fire on wildlife might be alive owing to modify in vegetation alter in wrap as well as food, soil-loss of trash, evidence of ash, hardening of exterior as well as owing to augment in facade pour. Insects extremely regularly reason massive harm (Chandler C, 1983) at what time they harass a forested area, deteriorating as well as tapering elsewhere the stands and leaving a lot of dead otherwise unhealthy trees that, being dry, are a great deal supplementary combustible. Thus it may be shrewd to deem each fire as a special case and keep in mind that animals determination almost certainly act in response in a dissimilar means in each occurrence. Consciousness of this essential most important as well as the impression of fire regimes is a obligatory pre-requisite for verdict creation and appraisal of ecological possessions of any fire, for example, far above the ground concentration fire in a grown-up forest will not be a disaster provided that a number of part of the environment provides corridor for free of charge movement of animals. Fire belongings on top of soil might have brawny influences on the work of art and configuration of post-fire forests. Forest fires take place in roughly each and every one types of ecosystem, a number of these ecosystems are tremendously responsive in the direction of fire, other than devoid of succeeding explosion of wildfires, they can recover. Alter in soil properties subsequent to fire produces unreliable responses inside the water, vegetation dynamics and fauna of ecosystems. The

extensive range of belongings is owing to the intrinsic pre-burn unpredictability in these possessions, fire behavior uniqueness, season of on fire, and pre-fire and post -fire ecological situation such as timing, amount and duration of precipitation.

Threatened Species in the World

Sl. No	Name of Countries	Threatened species
1.	United States	1287
2.	Malaysia	1236
3.	Indonesia	1225
4.	Mexico	1091
5.	China	995
6.	India	988
7.	Tanzania	979
8.	Brazil	965
9.	Madagascar	929
10.	Australia	906
India species type Plants= 332 (33.6%), Fish =216 (21.9%) , Mammals=96 (9.7%), Birds=82 (8.3%), Amphibians=74 (7.5%), Reptiles= 53(5.4%) ,Molluscs (Snail-octopus family)= 07 (0.7%) Other Invertebrates =128(13.0%)		

Table: Endangered Species in the World

These changes be able to also consequence in various circuitous impacts counting increased water repellency, which results in decreased infiltration and greater than before excess that over and over again results in augmented erosion.

7. Role of Manager of the Fire Management

The frequency of forest fire inside the country is resting on the augment as well as supplementary area is burned each year. The most important cause of this stoppage is the gradually come up to the trouble. Both the national focal point and the technical possessions requisite for at the bottom of a methodical forest fire running programme are not there in the country. Imperative forest fire running rudiments like planned fire centre's, management in the middle of Ministries, funding human reserve development, fire research, fire running, in addition to extension programme are not there. Intended for winning make use of fire seeing that a management tool in sustainable forestry practices it is have got to carry out fire-avoidance measures in common fire flat areas as included element of forestry in agreement by means of scientific norms, get better in the air forest fire monitoring as well as ground-based fire judgment and patrolling.

- Decrease the upsurge of fuel, and consequently the concentration of prospect burns.
- Recycle nutrients bounce awake within litter
- Lessen rivalry, allowing obtainable trees to produce better. To be in charge of the infringement or development of unwanted plants and give confidence attractive food plants such as legumes for in cooperation scavenge and soil improvements, or shrubs.
- Leave snags that make available nesting spots intended for woodpeckers and other birds.
- To get rid of indigestible enlargement residual from preceding seasons.
- To rouse growth for the duration of seasons when there is little green grazing.
- To control or obliterate insect and disease.

- To aid in the enhanced giving out of animals on a variety or running unit and bird habitat.
- To rouse seed creation of cones, arrange seedbeds for seeding also obviously or falsely.
- To set up fire breaks in a system of defense from wildfire.
- To offer training for fire fighters and fire researchers.

8. Shifting Cultivation

The current put into practice of shifting cultivation inside the eastern and north-eastern regions of India is an profligate and instinctive form of land use. Most of the forest fires within India are intentionally put through small-scale farmers or landless rural people. In the north-eastern parts of India, the put into practice of hack as well as burn shifting cultivation is the most important reason of forest obliteration. The nearly all greatly pretentious areas are Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura. All over the country, an estimated 4.35million ha are affected through fire as element of shifting cultivation. According to a fresh estimate, an area of 18765.86 sq.km (0.59 % of the total geographical area) is beneath shifting cultivation. The belongings of shifting cultivation are overwhelming as well as extensive in humiliating the (State of Environment, 2009) environment and ecology of these regions. The earlier 15-20 years cycle of shifting cultivation on a exacting land has abridged to two of three years now. This resulted in large-scale deforestation, soil as well as nutrient loss, and invasion through weeds and supplementary species. The indigenous biodiversity has been exaggerated to a great degree. Morethan 6% area beneath tropical forests was rehabilitated to shifting cultivation sandwiched between 1980 and 1990 crossways each and every one tropical countries. Concerning 10% of forest land was rehabilitated to shifting cultivation in Asia during the on top of stage. The shifting cultivation areas usually take delivery of modest to high rainfall. Owing to get water on forces generated on or after the rain drops, the erosion of valuable top soil occurs. Consequently (Ranjan,R & Upadhyay,V.P., 1999) the major factors which sway the rate of soil erosion are the rainfall, the scenery of the terrain, as well as the type of vegetation and soil conditions. Frequent shifting from one land to the supplementary has exaggerated the ecology of these regions. The area beneath natural forest has declined. The fragmentation of habitat, restricted evaporation of inhabitant species and invasion by exotic weeds and supplementary plants are several of the additional ecological consequences of shifting agriculture. Orrissa accounts for the main area beneath shifting crop growing in India.



Figure: Shifting cultivation, north-eastern India



Figure: Forest Fire Caused By Jhum Burning

9. Forest Fire and Climate Change

Forest fire are a noteworthy of emitted carbon, which exacerbates, global warming as well as being an inimitable carbon go under the surface. Fire experts recognized climate change as a possible reason of fire-related threats to biodiversity in 4% of every single one ecoregions worldwide and 15 to 18 most important habitat types. Climate change is previously growing fire incidence as well as extent by changing the key factors so as to control fire. Warmth, precipitation, moisture. wind speed, ignition biomass, departed organic stuff, vegetation species composition in addition to arrangement, as well as soil moisture (IPCC,2001). These changes threaten appropriate ecosystem purpose in addition to the stipulation of ecosystem services (Hassan, et.al, 2005). In Latin America, it is predictable that great forest areas will be pretentious as a consequence of predictable changes within climate. One approximation calculates that fires on or after all the world's tropical forests in 1998 liberate 1-2 million tonnes of carbon, which is correspondent to one third of the emission beginning fossil fuel burning universal (IUCN/WWF, 2000).Warmer temperatures, decreased precipitation overland, augmented convective movement, increases in status biomass owing to CO₂ fertilization, increased fuels on or after disappearing vegetation, as well as great scale plant life shifts encompass the nearly everyone noteworthy mechanisms from side to side which global warming increases combustion at the global scale. People suffered from solemn respiratory troubles owing to toxic gases. On fire forests as well as grasslands as well insert to by now grave threat toward global warming. Recent extent put it to somebody that biomass might be a noteworthy global of methyl bromide, which is an ozone depleting chemical.

10. Conclusion

Growing numeral of forest fires within India has show the technique to ecosystem susceptibility ensuing in enormous threat to forest diversity. The forest fires is harmful, causes massive injure in more than a few parts of the country depleting valuable forest wrap and destroying a rich assortment of flora and fauna and valuable microorganisms. The consequence of forest fire on top of reputable trees of tropical forest viz. Sal and Teak species is less than subtropical and temperature forest species viz. Oak and Pine species owing to their high fattening worth. Falling annual rainfall as well as dehydrated spells during winters mutually by means of rising denote minimum temperature leads to heater

climate and heavy pressure on the forest ecosystems. Furthermore, elevated strength of forest fires in Sal and Sub-tropical forests leads to serve threat to biodiversity and renewable resources. Forest fires are a important basis of emitted carbon, which exacerbates global warming as well as being an unique carbon sink. Forest fires will become an rising problem in a lot of forest biomes. Climate alter might put in an supplementary pressure to the adverse belongings of sustained deforestation of the forest. The approach for forest fire management be able to be near the beginning uncovering and management comprehensive to higher altitudes, counting society contribution in management of fire. The function of forest fire be able to be vital in maintaining necessary biodiversity. Incorporated Fire management- a confirmed scaffold intended for assessing and balancing issues posed by in cooperation damaging and beneficial fires surrounded by the ecological, social and economic contexts inside which fires occur- can assist put off further degradation of fire regimes as well as restore areas where fire's natural role has been distorted. The burning of organic substance increases pH in soil owing to ash deposits on forest floor as well results in loss of fungal spores, actinomycetes and mycorrhiza other than the position of bacterial population is improved due to the enhanced ease of use of N as well as K and strength contain tolerated higher temperature and proliferated heavily after fire. A site specific research is essential to understand the dynamics of forest fire on top of the ecological, social in addition to inexpensive aspects for the reason that of the unpredictability in climate, soil and forest in India. We have to as well remain in intellect that the causes and solutions of fire-related problems are roughly for all time inextricably connected to supplementary critical concerns of our day, as well as climate change, invasive species and forest and rangeland running practices. The implementation of arranged fire intended for the managing of forest work of art, control of disease as well as insect etc. as a implement. There is an urgent call for to combine the data base as well as augment its consistency. Work studies might do by means of to be initiated to place the course for prospect fire planning. This should show the method to the expansion of fire plants based on an evaluation of when in addition to where fires take place in addition to the characteristics of the area, these factors would be essential for an well-organized greenhouse of the contemporary fire- fighting methods keen on additional part of India. A holistic approach have got to be followed counting participation of forest resident for the conservation and expansion of forest subsequent to fire proceedings for more rapidly and victorious revival of biomass and microorganisms.

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