Chapter 8

Forest Fires and Weed Management

8.1 Forest Fire and its management

Forest fires require the forest management's intense attention due to its effects on biodiversity. Inappropriate fire regimes can lead to major changes in community structure, including substantial risk of extinction. As per the National Institute of Disaster Management, 95 *per cent* of forest fires are caused by human beings. Forest fires and fire management are therefore increasingly recognised as important factors in biodiversity conservation and natural resource management[59].

Fig. 8.1: An image of forest fire at Bandipur national park
Source: Images taken during field visits by Audit.

8.1.1 Forests burnt by fire and different assessments for the same forest fire

Since forest fire is a threat capable of causing extensive damages to the forests, all the PAs are taking precautionary measures like maintenance of fire-lines and engagement of fire watchers during fire season *i.e.*, between February and May every year. The details of extent of forests burnt by fire in Protected Areas between 2011-12 and 2015-16 have been brought out in **Table 8.1** below:

[59] Fire management for Biodiversity Conservation: Key research questions and our capacity to answer them- Don A. Discoll et al, Biological Conservation- September 2010

Table 8.1: Details of forests burnt by fire in Protected Areas during the period 2011-12 to 2015-16

(Area in hectares)

Protected Area	2011-12	2012-13	2013-14	2014-15	2015-16
Bandipur Tiger Reserve	650.00	972.62	548.500	216.460	219.360
Bhadra Tiger Reserve	-	-	-	50.000	-
BRT Tiger Reserve	60.00	49.04	166.590	24.060	20.000
Cauvery Wildlife Sanctuary	1.75	262.40	571.000	386.000	-
Dandeli-Anshi Tiger Reserve	1.70	3.50	0.704	0.600	-
Kudremukh National Park	307.94	240.60	194.500	167.950	553.000
MM Wildlife Sanctuary	111.60	111.60	-	200.000	418.030
Madikeri Wildlife Division	61.25	-	2.000	8.900	8.090
Nagarahole Tiger Reserve	698.12	24.28	198.900	6.849	44.506
Sharavathy Wildlife Sanctuary	10.00	-	-	50.000	2.020
Total	1,902.76	1,664.04	1,682.194	1,110.819	1,265.006

(Source: Details furnished by the Department)

It could be seen that forest fires have caused substantial damages (*i.e.*, more than 100 hectares) in Bandipur TR, Kudremukh NP and Malai Mahadeswara Wildlife Sanctuary during the audited period. Also, Nagarahole NP had serious fires during 2011-12 and 2013-14. Though the total forest area affected by fire in all the sampled Protected Areas decreased between 2011-12 and 2014-15, it was observed that in certain forest fire cases, the area burnt by fires could have been under-stated by the Department, as brought out in the succeeding paragraphs.

- A major forest fire occurred during February - March 2012 involving both Bandipur and Nagarahole TRs. The PCCF and Managing Director, Karnataka Forest Development Corporation had assessed the forest area burnt in the Protected Areas which was, however, found to be different from the assessments done by these Tiger Reserves, as brought out in the **Table 8.2.**

Table 8.2: Assessment of forest area burnt by forest fires during 2012 by Department

(Area in hectares)

Protected Area	Burnt area as per PCCF letter	Burnt area recorded in the Division
Bandipur TR	973	650
Nagarahole TR	1,961	698.12

(Source: Details furnished by the Department)

Based on the request of 'Wildlife First' an NGO, Indian Space Research Organisation assessed[60] the forest area burnt in Nagarahole National Park by this fire to be 24.5 sq km *i.e.*, 2,450 hectares. The huge difference between these assessments indicates that Departmental assessments were highly conservative and lesser than the actual loss.

- One more major fire had occurred in Nagarahole NP during March 2014. The area burnt was initially assessed at 60 hectares. The area damaged by this fire in adjoining Virajpet Territorial Division was 172 hectares and

[60] Resourcesat-2 AWiFS based Rapid Forest Fire Burnt Area Assessment

hence, the total area burnt was assessed at 232 hectares. However, the assessment of ICT cell of the Department had indicated the total area burnt as 383 hectares. Therefore, PCCF had directed the Reserve management to do the ground truthing which revealed that the burnt area was 179 hectares. The fact that the second assessment had more than doubled the initial assessment clearly establishes that there is no scientific / systematic method in place to assess the forest area burnt by fires even though forest fires are very common, especially in Bandipur and Nagarahole Tiger Reserves. As a result, the possibility of under-reporting in these cases cannot be ruled out.

- In Dandeli-Anshi Tiger Reserve, the details furnished indicated that no forests were burnt by fire during 2015-16. On the contrary, a newspaper report[61] indicated that one fire incident had happened on 23/3/2016 and there were instances of forest fires earlier too, each of which had burnt an area of an *acre* or so.

The above position / illustration clearly indicate that all the forest fire incidences are not being recorded, and even those recorded might be getting under-reported. Hence the actual loss could be still higher.

The incorrect assessment of forest area burnt is liable to lead to faulty planning and insufficient management strategies, leading to unpreparedness of the Department to deal with forest fires in their actual scale. Such a scenario would then render the Department's interventions to fight forest fires inadequate, causing widespread damages to forests and wildlife by forest fires in future. In addition, it was observed that major forest fire incidences were reported in Bandipur, Nagarahole and BRT Tiger Reserves during 2016-17.

The Government stated (March 2017) that all the fire incidences were man-made and presence of *Lantana* was adding up to the increase in forest area burnt by fire. With reference to differences within the Departmental figures, it was stated that the matter would be examined.

8.1.2 Non-preparation of fire management plan

Fire is a major concern in all the Protected Areas and the spread of fire depends on the landscape features such as gradient and other aspects. Hence, a fire management plan should be in place to deal with any eventuality caused by these fires. Further some PAs share borders with other PAs or PAs / forests in neighbouring States like Tamil Nadu and Kerala, the possibility of one forest fire causing damages to more than one PA / State cannot be ruled out. Therefore, a PA level / landscape level fire management plan would be required to be prepared to address such eventualities.

Even though chances of occurrence of forest fires cannot be totally eliminated, frequency and magnitude of fire can always be regulated by adopting proper management measures. Therefore, these measures should have been included in the Management Plans (MPs). Out of six[62] PAs where high incidences of

[61] The Hindu, Belagavi edition dated 24/3/2016
[62] Bandipur TR, Nagarahole TR, BRT TR, Kudremukh NP, Cauvery WLS and MM WLS

forest fires were reported, it was noticed that the MP of Kudremukh National Park (2003-13) does not include Fire Vulnerability Map (FVM), while new MPs for Cauvery WLS and MM WLS were under preparation. Further, compartments / beats vulnerable to fire incidents are not listed in the MP. Such deficiency in planning is liable to result in tardy reaction to forest fires, if and when they occur, as well as prevent the management from drawing up suitable mitigating measures in advance.

Since the forests in India are prone to forest fire incidences which are manmade, it becomes necessary to take preventive measures, prepare action plans and institutional readiness to address major events. It also becomes important to identify fire prone areas and maintain proper data on fire incidences so that proper Management Plan can be drawn up in future to reduce this threat and conserve wildlife better.

Recommendation 12: Satellite based analysis should be linked to ground truthing to assess the exact extent of forest fires. Protected Area specific Action Plans for fire fighting must be made a mandatory component of Management Plans concerned so that the Department is better equipped to mitigate fire.

8.2 Weed Management in National Parks and Wildlife Sanctuaries

Invasive Alien Species (IAS), in the context of Convention on Biological Diversity (CBD), for which India is one of the signatories, means an "alien species whose introduction and / or spread threatens biodiversity of a given area". In Protected Areas, as elsewhere, impacts from alien species take the form of impacts on ecosystem function, ecosystem structure and impacts at the level of species communities or habitats as well as the level of species. CBD recognises the importance of this global issue and calls on contracting parties to: "*prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitat and species" {Article 8(h)}.* Further, the "Invasive Alien Species and Protected Areas - A Scoping Report"[63], done in 2007 by IUCN, had observed that the threat of alien species to PAs would increase in future. The report also observed that the priority is to apply prevention, early detection and rapid response. The scoping study found that key impediments and challenges to dealing with IAS in PAs include lack of capacity for mainstreaming IAS management into overall PA management, lack of capacity for site based effective IAS management, lack of awareness of the impacts of IAS on PA values, as well as lack of awareness of options for management especially the importance of prevention and early detection, lack of practical management information at site level, *etc.* Thus, it is obvious that IAS is a proven threat to biodiversity and PA management should take priority actions towards this threat by way of prevention, early detection and rapid response.

[63] Scoping the scale and nature of Invasive Alien Species threats to Protected Areas, Impediments to IAS Management and means to address those impediments produced for the World Bank as a contribution to the Global Invasive Species Programme – March 2007

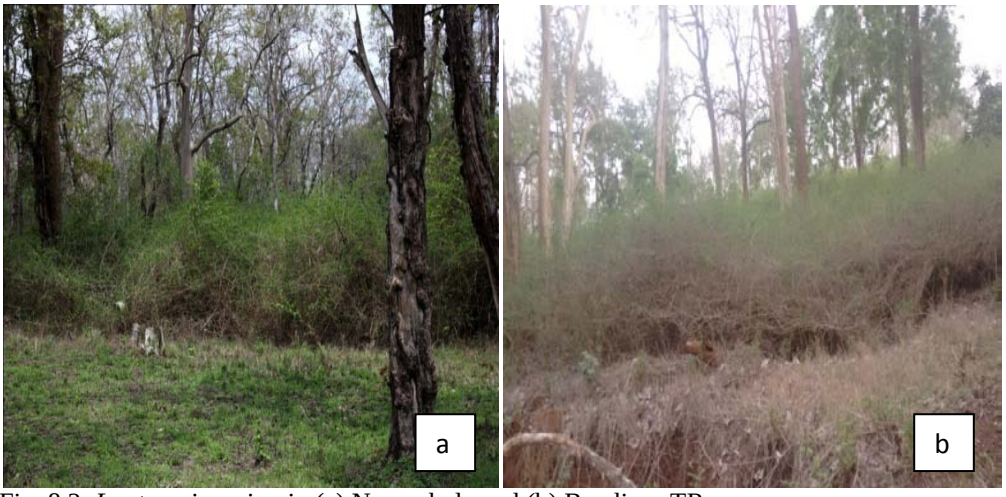

Fig. 8.2: *Lantana* invasion in (a) Nagarahole and (b) Bandipur TRs
Source: Images taken during field visits by Audit.

Further, invasion by exotic species is considered a leading cause for decline of native species and habitat degradation. The invasion of natural communities, particularly conservation areas, by introduced plants constitutes one of the most serious threats to biodiversity and has been shown to profoundly alter ecosystem structure, function and aesthetic value of many habitats around the world.

Though IAS had become a major threat in BRT Tiger Reserve, Bandipur TR and Nagarahole TR, no departmental research was conducted to assess its impacts and address rapid response to this threat. It was, however, observed that independent researches were conducted at Bandipur (2006) [64] and BRT (2008)[65] Tiger Reserves which revealed that:

- *Lantana* invasion in BRT had increased from 41 *per cent* of (inventoried) plots (1997) to 81 *per cent* (2008) during 11 years. However, no further assessments regarding the extent of infestation were made. As a result, PA management was not even aware of the level of the problem.
- In a study conducted at Bandipur TR (2006), it was observed that *lantana* had invaded a large portion of the TR with very dense *lantana* in 1 *per cent* of the Reserve and between 13 and 50 *per cent* of the Reserve under moderate levels of invasion.
- *Lantana* clearly reduced species richness of native understory species while also causing compositional changes in the herbs, shrubs and tree seedlings in Bandipur.
- *Lantana* was found to be the most dominant of the species in BRT (2008) and *lantana* invasion was accompanied by reduction in evenness in the native community and evidence for drastic reduction in regenerating size classes of trees, suggesting population declines in the future.

[64] Impact of *Lantana camara*, a major invasive plant, on wildlife habitat in Bandipur Tiger Reserve, Southern India by Ayesha Prasad, 2006
[65] Patterns and processes of *Lantana camara* persistence in South Indian tropical dry forests submitted by Bharath Sundaram and research carried out at ATREE,

- In Bandipur TR[66], four horned antelope occurrence was negatively related to the alien weed *lantana* leading to decline of its population in the PA.

Thus, it is evident that *lantana* had taken over in BRT TR, while Bandipur and Nagarahole NPs may also follow suit as no interventions have been programmed in the Tiger Reserves to address the problem. In Bandipur NP, currently (October 2016) *lantana* infestation was found to be to an extent of 81,141 hectares[67] of which 36,210 hectares (41[68] *per cent* of the Reserve) were densely infested. When compared to the earlier assessment (Ayesha Prasad-2006) which had observed that one *per cent* of Tiger Reserve was densely infested, it could be seen that within 10 years, the dense infestation had spread over 41 *per cent* of the Tiger Reserve.

In addition to *lantana*, other invasive species like *eupatorium, parthenium, cromolaena, etc.,* were also observed in the Protected Areas. The details of major weeds assessed and measures proposed to address this threat in MP/TCP of the PAs have been brought out in **Appendix 6.**

Though the MP / TCP identified *lantana* and *eupatorium* as major weeds, measures taken to address the issue were too marginal. During the period 2011-16, it was observed that *lantana* / *eupatorium* were manually removed in Bandipur, BRT, Bhadra and Dandeli Anshi Tiger Reserves without adopting any scientific methods to address the issue. The areas so tackled are brought out in **Table 8.3** below:

Table 8.3: Area covered and expenditure incurred on removal of weeds during 2011-12 to 2015-16 in Protected Areas

(Area in ha and amount in ₹ lakh)

Protected Area	2011-12		2012-13		2013-14		2014-15		2015-16		Total	
	Area	Amt	Area	Amt	Area	Amt	Area	Amt	Area	Amt	Area	Amt
BRT TR	0	0	0	0	15	2.25	20	3.0	0	0	35	5.25
Bandipur TR	NA	0.27	0	0	0	0	100	6.48	0	0	100	6.75
Bhadra TR	165	2.94	0	0	0	0	0	0	30	1.19	195	4.13
Kudremukh NP	0	0	0	0	0	0	0	0	0	0	0	0
Dandeli- Anshi TR	0	0	0	0	0	0	80	2.19	0	0	80	2.19
Nagarahole TR	0	0	0	0	0	0	0	0	0	0	0	0

(Source: Details furnished by the Department) NA: Not accounted

However, no scientific methods like Prof. C R Babu method (cut root method) or other methods were taken up and only manual removal on smaller scales was attempted. Thus, it is clear that no major interventions have been made in these PAs during the last five years to address this serious issue.

[66] Habitat factors affecting site occupancy and abundance of four horned antelope at Bandipur
[67] Excluding Nugu range which is a different sanctuary
[68] (36,210 ÷ 87,224) × 100

Fig 8.3: Elephant being dwarfed by *lantana* cover at Bandipur Tiger Reserve
Source: Images taken during field visits by Audit.

Though infestation of *lantana* in Bandipur Tiger Reserve has reached alarming situation and the seriousness of the issue was brought out in the independent research in 2006 itself, the Tiger Conservation Plan of the Tiger Reserve merely proposed conducting scientifically designed field experiments for assessing further efforts to be made and also to assess its positive impacts. However, these too have not been carried out yet. The absence of departmental studies / measures to address this serious problem could only worsen the situation.

The Department stated that Prof C R Babu method had been tried in Bandipur TR in the year 2010-11, but this effort did not yield any concrete results, hence the same was not pursued. However, no other method was attempted thereafter. Commercial use of *lantana* for making furniture, household goods and toys by using locals and other ways of using this abundant weed for manufacture of Wood Polymer Composite as brought out in the **Box 3** could be some ways of addressing the issue as this would not only ensures removal of *lantana* but also address the socio-economic issues of locals. However, since it is very difficult to eradicate weeds, especially *lantana*, concerted efforts have to be in place for IAS management so that the habitat integrity is ensured by safeguarding it against degradation, which sadly is lacking currently, throwing the whole ecosystem to jeopardy.

The Government agreed during the Exit Conference that *lantana* was a major threat to the wildlife and about 50 *per cent* of the PA area was infested by it. It was also stated that action would be taken for mechanical removal of the weed and commercial exploitation could be attempted based on availability of market for *lantana* products.

Box No. 3

Commercial use of *lantana*

***Lantana* Craft Centre, a registered society was established in 2004 by Ashoka Trust for Research in Ecology and the Environment (ATREE). This centre has trained more than 350 persons from different parts of South India in crafting toys, household goods, and furniture from *lantana*. It has also been used as an alternative raw material for making Channapatna toys, which are otherwise, made from *Wrightia tinctori* wood, which is fast depleting. Further, Institute of Wood Science and Technology, has developed Wood Polymer Composite from *lantana*[69] which would further increase the demand for commercial use of *lantana*. In addition, in Mudumalai Tiger Reserve, a local Non Governmental Organisation, "The Shola Trust" had worked with tribal communities to help them make furniture out of *lantana*. This works as an economic driver which makes it viable for communities to earn their living and also effectively controls spreading of *lantana*[70].**

Fig 8.4: Images of furniture made out of *lantana*

Use of *lantana*, by local communities in Southern India and possible causes and consequences of its use were analysed[71] in a study done (December 2013) at three places in Southern India including Malai Mahadeswara Hills area of Karnataka. The study observed that one of the strategies to address Invasive Alien Species should be a greater inclusion of local communities in local management programmes or foster increasing use of Invasive Alien Species.

Recommendation 13: Department needs to strengthen its research activities to control weeds.

[69] http://www.thebetterindia.com/62268/bengaluru-scientists-lantana-wood-polymer-composites/

[70] Examining the spatial spread of *lantana camara* in the Mudumalai Tiger Reserve, report submitted to Tamil Nadu Forest Department, June 2014 by Tarsh Thekaekara with help of others

[71] Invasive alien species as drivers in socio-ecological systems: local adaptations towards use of *lantana* in Southern India by Ramesh Kannan, Charlie M Shackleton and R Uma Shanker