17 The Economic Dimension of Wildland Fires

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Abstract

The economic relevance of wildland fire management and protection programs is ever growing, particularly considering mounting wildfire costs and losses globally, and the justifications required for budget allocations to management and protection of forest ecosystems. However, there are major difficulties in grappling with the problem of rapidly increasing wildland fire management costs. For example, in the U.S., the U.S. Department of Agriculture Forest Service from 1997-2008 has spent more than $US11.5 billion on fire suppression alone, on wildfires affecting more than 26 million ha of land. It is important to keep in mind that inclusion of the expenditures for the other four federal agencies with fire protection responsibilities and the expenditures of all other states with wildland fires could possibly put the figure in the realm of hundreds of billions. Canada spends an average of between $US531 million annually on fire suppression, prevention, and prescribed burning alone. Mexico and the Central America region are also suffering tremendous losses to forest fires. For example, during 1998 more than 7.7 million ha of forest and agricultural were affected. In the South American continent, during the 1990s Brazil, Argentina, and Bolivia had wildfires that burned annually an average of 1.03, 1.5 and 0.92 million hectares respectively of forest lands. Suppression expenditures and financial losses due to wildfires in the South American region are difficult to obtain. However, some estimates of the financial losses of forest fires in South America go as high as $US1.6 billion annually in the 1990s. The five most southern countries of the European Union during the period from 2000 to 2007 suffered on average 60,000 fires affecting 476,000 ha of forest lands. Unfortunately, there is not yet an estimate of the suppression expenditures or the economic impact of those fires in the individual countries and the Mediterranean basin region. In 2009 Australia experienced large wildfires affecting more than 430,000 ha, wiping out complete towns, killing 173 persons, destroying over 2000 homes, leaving more than 7,500 people homeless and creating havoc in the local economies. Recent estimates place the cost of bushfires to Australia at $US6,625 million.

Keywords: Wildland fire management costs, wildland fire fatalities, fire suppression expenditures, wildfire disasters

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The economic relevance of wildland fire management and protection programs is ever growing, particularly considering mounting wildfire costs and losses globally, and the justifications required for budget allocations to management and protection of forest ecosystems. However, there are major difficulties in grappling with the problem of rapidly increasing wildland fire management costs. For example, in the U.S.A., the U.S. Department of Agriculture Forest Service from 2000-2011 has spent more than $US 16 billion on fire suppression alone, on wildfires affecting more than 33×10^6 ha of land (González-Cabán, 2008; González-Cabán and Omi, 1999; González-Cabán, 2009) (Tab. 17.1). In 2003, in California alone, 300,000 ha were burned, more than 3,500 homes destroyed, 22 people killed, and more than $US3.5 billion worth of property losses (González-Cabán, 2008). It is important to keep in mind that inclusion of the expenditures for the other four federal agencies with fire protection responsibilities and the expenditures of all other states with wildland fires could possibly put the figure in the realm of hundred of billions. For example, recent estimates for the state of California put the economic impact of wildfires during 2008 conservatively upward of $10 billion (pers. comm. with Bob Zybach on 5 May 2009). Suppression expenditures alone were estimated in excess of $US1 billion (Boxall, 2008). Lately there has been a growing concern on the disparity between reported costs by the USDA Forest Service and actual damages and losses (Morton et al., 2003; Lynch, 2004; Dunn et al., 2005, Calkin et al., 2005; Mason et al., 2006; Western Forestry Leadership Coalition, 2009; Mowery, 2013). Some attempts have been made to try and figure out the factors contributing most to wildland fire costs, and estimating individual fire suppression costs, although more research is needed (González-Cabán, 1984, 1985; McKetta and González-Cabán, 1985; González-Cabán and McKetta,1986; González-Cabán et al., 1986; Smith and González-Cabán, 1987; Liang et al., 2008).

Canada spends an average of between $US531 million annually on fire suppression, prevention, and prescribed burning alone. This does not account for timber, recreation, health and personal property losses. The mean annual area burned associated with these expenditures is 2.043×10^6 ha and an average of almost 8,000 wildfires annually (Tab. 17.2).

Mexico and the Central America region are also suffering tremendous losses to forest fires. For example, one of the worst forest fires year in record in the area was 1998 when more than 2.3×10^6 ha of forest lands was affected; Mexico bearing the brunt of it with 0.85×10^6 ha burned. Adding the area burned to agricultural uses in the region (5.3×10^6 ha) bring the total for 1998 to 7.7×10^6 ha. That is the equivalent of the entire country of Panama! Recent estimates of the number of fires and area affected annually in the combined Caribbean and Central American regions was estimated as 41,540 fires and 1.1223×10^6 ha respectively (Julio Alvear, 2008). Unfortunately, fire suppression expenditures information is not readily available in many of the Central America and Caribbean region countries. However, just three of the region countries (Guatemala, Honduras, and Mexico), spend over $US21 million a year in personnel and equipment. The fire management budget for Mexico in 2012 is estimated at close to $US67 million (Juan Arturo Raygoza, pers. comm., 2 May 2012).

Table 17.1. US Department of Agriculture Forest Service Area burned and associated suppression costs for the period 2000-2011. Source: National Interagency Fire Center Wildland Fire Statistics and the USFS Wildland Fire Management budget FY2000 - FY2011, and Mark Lichtenstein, Branch Chief, Budget and Planning, FS.

Year	Area Burned (million ha)	Suppression costs ($US billion)
2011	3.53	1.414
2010	1.39	0.898
2009	2.41	1.018
2008	2.21	1.980
2007	3.78	1.800
2006	4.00	1.900
2005	3.52	0.876
2004	2.75	0.890
2003	1.99	1.326
2002	2.81	1.661
2001	1.45	0.918
2000	3.41	1.362
Total	**33.25**	**16.043**

Table 17.2. Canada number of fires, area affected, and total fire protection expenditures for the period 2000-2010: Source: Canadian Interagency Forest Fire Centre (CIFFC), Canada Report 2011, and Mr. Serge Poulin, Operations Manager CIFFC.

Year	Number of fires	Area affected (million ha)	Total expenditures ($US million)
2010	7,319	3.156	636.169 [1]
2009	7,167	0.755	1,001.951
2008	6,036	1.310	713.720
2007	7,581	1.301	498.107
2006	9,713	2.055	139.018
2005	7,438	1.706	449.777
2004	6,647	3.275	539.275
2003	8,243	1.635	885.081
2002	7,847	2.758	477.002
2001	7,714	0.630	300.651
2000	5,469	0.648	269.176
Total	**81,174**	**19,229**	**5,909.927**

[1] Incomplete; missing information from some agencies.

In the South American continent, during the 1990s Brazil, Argentina, and Bolivia had wildfires that burned annually an average of 1.03, 1.5 and 0.92×10^6 ha of forest lands. These three countries alone account for about 88 percent of the total annual area burned in the decade. As in the Caribbean and Central American regions suppression expenditures and financial losses due to wildfires in the South American region are difficult to obtain. However, some estimates of the financial losses of forest fires in South America go as high as $US1.6 billion annually in the 1990s (Julio Alvear, 2004). During the recent decade it is estimated that the number of fires and area affected annually in all South America is 278,460 ha and 21.276×10^6 ha respectively. Despite scant studies and information on suppression expenditures and economic impact of these fires (other than Chile, cf. Tab. 17.3) the financial burden of that level of wildfires has been estimated to be more than the $US1.6 billion during the 1990s (Julio Alvear, pers. comm., 28 April 2009). This is a significant figure, particularly when the social and ecological consequences of the fires are not even considered.

Table 17.3. Chile number of fires, area affected, and total fire protection expenditures during the period 1998-2007. Source: Julio Alvear (2008) and Fernando Maldonado, CONAF (pers. comm. 3 May 2012).

Year	Number of fires	Area affected (ha)	Total expenditures ($US million)
2011	4,952	47,035	26.296
2010	4,069	58,364	24.101
2009	6,157	64,222	26.707
2008	6,975	42,037	14.344
2007	5,143	43,384	9.104
2006	5,396	19,322	5.461
2005	6,653	65,300	7.879
2004	6,430	50,687	8.907
2003	7,572	41,988	6.359
2002	6,701	90,069	16.174
2001	5,376	10,921	3.824
2000	5,252	17,183	4.100
Total	**70,676**	**550,512**	**153.256**

Every year, on average, Europe experiences 45,000 forest fires, burning approximately 0.5×10^6 ha of forest and woodlands. Between 1989 and 1993 close to 2.6×10^6 ha of land were burned. 2003 was a particularly significant year for Europe. In Portugal more than 0.45×10^6 ha were affected by wildfires; France saw an increase in area burned of more than

30 percent from the previous decad. During 2007 Greece experienced significant forest fires that affected more than 0.27×10^6 ha of forests and other lands, burned more than 3000 homes and killed more than 78 people (Xanthopoulos, 2008, 2009). Italy also experienced significant fires affecting almost 0.23×10^6 ha of forest lands. The five most southern countries of the European Union during the period from 2000 to 2007 suffered on average 60,000 fires affecting 0.476×10^6 ha of forest lands (Joint Research Centre, 2007). Unfortunately, we still don't have a good estimate of the suppression expenditures or the economic impact of those fires in the individual countries and the Mediterranean basin region. In 2009 Australia again experienced extremely large and severe wildfires affecting more than 0.43×10^{-6} ha, wiping out complete towns, killing 173 persons, destroying over 2000 homes, leaving more than 7500 people homeless and creating havoc in the local economies (Rees, 2009a, 2009b). A seminal paper by Ashe (2009) estimates the cost of bushfires to Australia at $US6,625 ($AU8,500) million. The author also determined "…that Australia is investing approximately $US5,612 ($AU7,200) million (or 85% of the total cost of fire) to manage a loss of approximately $US1,013 ($AU 1,300) million (or 15% of the total cost of fire). He further questions the effectiveness and efficiency of such investment given the amount of losses.

Large forest fires in China (1987), Mongolia (1996-1998), Russia (1998, 2003), and other parts of the world demonstrate that wildfire disasters are affecting many countries. There are only a few detailed studies on ecological and economic impacts of fires. In 2003 the Russian Federation was affected by wildfires affecting 20.2×10^6 ha of forest and non-forest lands in the region around Baikal lake alone (Huang et al., 2009; Goldammer, 2010; Goldammer et al., 2012). Considering that the export value of forest products from global boreal forests is close to 47% of the world total (Kuusela, 1990, 1992) the economic impact of fires in the boreal forests could be enormous, although not yet quantified.

The economic impact of the Indonesian fires and haze in 1997-98 have been estimated conservatively at about $US4.5 billion to the economies of Indonesia, Malaysia, and Singapore (EEPSEA, 1997; Rowell and Moore, 1998; Buttler, 2006). And this did not include long-term health damages, loss of life, reduced crop productivity, etc.

Based on a worldwide study it is estimated that approximately 350×10^6 ha of vegetated land (forest and non forest) are burned annually (Tansey et al., 2004). This is equivalent to burning the area of the Indian subcontinent every year! Yet, we are still struggling with the problem of lack of good statistical data on suppression expenditures and economic impact of wildfires in the majority of the countries of the world. Not enough is being done to develop a better system of collecting economic data uniformly.

However, the Global Fire Monitoring Center (GFMC) initiative to systematically collecting statistical data and narratives from government sources, correspondents and the media, on human and economic consequences of wildfires is pointing to the right direction. The Global Wildland Fire Fatalities Reports of 2008 to 2010 revealed 998 fatalities for the period including wildland firefighters, military and civilians. Their 2011 report included worldwide data on structural damages and other losses caused by wildfires, and evacuations

due to wildfire threat (GFMC, 2012a). However, the numbers of fatalities and damages include only those reported in the media and by GFMC correspondents. Thus, due to the lack of a comprehensive national / international reporting system the statistical dataset is likely to be incomplete, especially considering the numerous unreported numbers of wildfires and associated fatalities in remote regions of the developing world. However, considering that in 2011 over 85,000 evacuations were recorded, and more than 7,000 homes lost globally, and the preliminary 2012 assessment by GFMC, showing that in the U.S.A. alone more than 80,000 people had been evacuated and more than 1300 homes lost, indicate the magnitude of the socioeconomic significance of wildfires affecting society; and underscore the importance of collecting complete global statistical data (GFMC, 2012b).

It has become evident in the recent years; we have a public and governmental oversight that demands greater accountability for fire management actions and expenditures. A diversity of wildland uses is affected, from recreation and wildlife interests, and ecosystem sustainability to traditional commodity outputs. There are multiple competing demands on the limited financial resources of governments. To achieve a balanced distribution of budget funds according to the priorities established in strategic and economic planning processes, appropriate analytical tools and methodologies that allows us to measure the direct suppression expenditures and the financial and economic impacts of wildfires worldwide are needed.

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