

22 Beyond Climate Change: Wildland Fires and Human Security in Cultural Landscapes in Transition – Examples from Temperate-Boreal Eurasia

Johann Georg Goldammer¹

Abstract

In many regions of Eurasia cultural landscapes that were formed by traditional agrarian societies over centuries are changing rapidly. The process of rural exodus and the rapidly accelerating trend of urbanization is associated with abandonment of land cultivation and thus directly or indirectly affecting cultural and wildland fire regimes. This chapter looks at the specific issues linked with wildland fire, land use and land-use change in Eurasia, and to wildfires and threats emerging from the heritages of civilization. While the temperate-boreal zone of Eurasia is in the focus of this chapter, some views to the cultural landscapes of North America reveal comparability and similarities between continents. An increasing awareness of newly arising or newly perceived fire-related problems by the general public and by policy makers is apparent. However, development of fire management solutions such as the adjustments to public policies affecting land management and operational fire management to the changing land use conditions and society's vulnerability are lagging behind. Changing paradigms in ecology and nature conservation have recently led to reconsidering fire-exclusion policies in certain sectors of land / landscape management, nature conservation and forestry. However, the use of prescribed fire in ecosystem management in Europe may not exclusively target those vegetation types that have been shaped by fire over historic time scales, but rather to introduce fire as a tool to substitute abandoned cultivation practices. However, use of fire in agriculture is being questioned where new insights into the side effects of burning are revealed by recent research. For example, there are indications that deposition of black carbon emitted from agricultural spring fires in Northern Eurasia are impacting the albedo of the Arctic environment, leading to acceleration of warming and melting of snow and ice cover. As a symptom of these developments the terms "necessary" and "unnecessary" burning in the agricultural sector in temperate-boreal northern Eurasia are entering the wildland fire terminology.

Keywords: Cultural landscape fire, rural exodus, land cultivation abandonment, radioactive pollutants, prescribed burning

1 Global Fire Monitoring Center (GFMC), Max Planck Institute for Chemistry, c/o Freiburg University / United Nations University, Freiburg, Germany.
Address for correspondence: johann.goldammer@fire.uni-freiburg.de

Introduction

In many regions of Eurasia cultural landscapes that were formed by traditional agrarian societies over centuries are changing rapidly. The process of rural exodus and the rapidly accelerating trend of urbanization is associated with abandonment of land cultivation and is thus directly or indirectly affecting cultural and wildland fire regimes. This chapter identifies the specific issues linked with wildland fire, land use and land-use change in Eurasia, and the wildfire threats emerging from the heritages of civilization. While the temperate-boreal zone of Eurasia is the focus of this chapter, some analyses of the cultural landscapes of North America reveal comparability and similarities between continents.

Socio-economic Changes, Industrial Heritages and Emerging Fire Threats in Eurasia

Temperate-boreal Eurasia extends from Western Europe to Asia's Far East and spans more than 200 degrees of longitude. While the region contains a large variety of ecosystems and land-use systems, there exist commonalities of determinants of wildland fire between these countries and subregions that share similar historic and contemporary natural, cultural and social conditions.

Some hazards and risks associated with wildland fires have been perceived as threats only recently due to a better scientific understanding of conditions influencing wildland fire. The public perception of wildland fire throughout the region has been stirred significantly by the discussion of the anticipated consequences of climate change on forest fire occurrence and impacts. However, some recent wildfire episodes also revealed the vulnerability of society to direct and secondary effects of fire such as the impacts of fire smoke pollution on human health and security.

Wildland fires burning at the interface of, or even inside residential, urban and industrial areas, and fires burning on terrain contaminated by industrial deposits and heritages of armed conflicts are perceived as new, unprecedented threats – although they have existed before, albeit unnoticed publicly and politically. It is also becoming evident that the alteration of fire regimes in the cultural landscapes of Eurasia is driven fundamentally by land-use change.

Recent wildfire episodes in temperate-boreal Eurasia have resulted in severe environmental damages, high economic losses and considerable humanitarian problems. After the Mediterranean fire crisis in 2007, followed by the fire and smoke episode in Western Russia in 2010, several key issues affecting wildland fire in the cultural landscapes of temperate-boreal Eurasia have been identified:

- Increasing rural exodus and urbanization, resulting in abandonment of traditional land cultivation (agriculture, pastoralism, forestry) resulting in an increasing wildfire hazard;
- Urbanization resulting in a reduced rural work force, including availability of rural firefighters;

- Re-privatization of formerly nationalized forests resulting in the absence of forest and fire management in smallholder forest estates;
- Weakened governance over forestry and decreased fire management capabilities in many Eastern European and Central Asian countries as a consequence of the transition of national economies, often associated with the uncontrolled or illegal forest use and increase in related wildfires;
- Increasing occurrence of wildfires affecting the perimeters of metropolitan areas, settlements and developments dispersed throughout wildlands;
- Secondary problems associated with wildfires, e.g., those burning in territories contaminated by radioactivity and remnants from armed conflicts (e.g., unexploded ordnance, land mines, uranium-depleted ammunition); or wildfires affecting agricultural lands treated with pesticides; landfills, other industrial waste and structures containing hazardous materials, especially at the urban / residential perimeters;
- Consequences of climate change on cultural fire regimes and ecosystem vulnerability (e.g., climate-driven transformation of former fire-free or fire-protected natural ecosystems and land-use systems such as peat bogs and high-altitude mountain ecosystems to ecosystems becoming vulnerable to and increasingly affected by wildfires).

The assessment of changing fire regimes and the increasing vulnerability of society and subsequent public policy responses are influenced by new scientific insights into the composition of fire emissions and their impacts on the environment and human health and must address the following considerations:

- Effects of gas and particle emissions from open burning vegetation fires on human health;
- Vulnerability of industrial and rural societies to air pollution generated by vegetation fires;
- Impacts of radiatively active trace gases and particle emissions from vegetation fires affecting the functioning of the atmosphere and contributing to climate change;
- Impacts of fire emissions on ecosystems, e.g. the consequences of deposition of fire-emitted black carbon in the arctic environment;
- Resulting conflicts in fire management, e.g., controversial views on the acceptance of prescribed burning.

While a growing acknowledgment of these issues by the public and by policy makers can be noted, there is a lack of review, adjustment or development of appropriate fire management policies.

The recently published *White Paper on Use of Prescribed Fire in Land Management, Nature Conservation and Forestry in Temperate-Boreal Eurasia* (Goldammer, 2010a) is an example for changing perceptions of the role of fire in cultural landscapes. The white paper reveals that the use of fire – including disturbance related to swidden (shifting) agriculture and other land cultivation practices – have contributed to shaping landscape patterns of high

ecological and cultural value and diversity across temperate-boreal Eurasia in areas such as heathlands, open grasslands and meadows. In the eastern Euro-Siberian biota, e.g. in the light taiga, natural fires have shaped open and stress-resilient forest ecosystems (Sannikov and Goldammer, 1993).

Changing paradigms in ecology and nature conservation have recently led to reconsidering fire-exclusion policies in certain sectors of land / landscape management, nature conservation and forestry. However, the use of prescribed fire in ecosystem management in Europe may not exclusively target those vegetation types that have been shaped by fire over historic time scales, but rather may introduce fire as a tool to replace abandoned cultivation practices (Goldammer, 2010a).

A sound understanding of the “pros and cons” of prescribed fire application is as necessary as consideration of the side effects of fire use. Large areas threatened by land abandonment are embedded in industrialized regions in which society is becoming increasingly intolerant of fire emissions. The fire and smoke episode in Western Russia in 2010 is a striking example of both increased perception and vulnerability (Goldammer, 2010b). Legal restrictions for open burning are included in clean-air rules and the obvious general necessity to reduce those gas and particle emissions that are threatening human health (cf. chapter 18 of this volume). Concerns of those parties that consider prescribed fire emissions a contribution to the increase of the anthropogenic *greenhouse effect* and thus global warming complicate the debate. The traditional use of fire in agriculture is being questioned due to new insights into the side effects of burning emerging from recent research. For example, there are indications that deposition of black carbon emitted from agricultural spring fires in Northern Eurasia are impacting the albedo of the Arctic environment, leading to acceleration of warming and melting of snow and ice cover (Clean Air Task Force, 2009; Doherty et al., 2010; Hegg et al., 2010; McCarty et al., 2012). As a symptom of these developments the terms “necessary” and “unnecessary” burning in the agricultural sector in temperate-boreal northern Eurasia are entering the wildland fire terminology.²

On the other hand it is noted that nature conservation agencies, non-government actors and the general public have developed a rather sound understanding and perception of the “nature of fire” compared to the situation two to three decades ago. International (regional) dedicated networks and research projects such as the *Eurasian Fire in Nature Conservation Network* (EFNCN)³, within which the *White Paper on Use of Prescribed Fire* was developed, and particularly the European Integrated Project *Fire Paradox*, have significantly contributed to the acceptance of fire use in wildfire hazard reduction and fire suppression (Sande Silva et al., 2010; see also Birot, 2009).

2 The *International Conference on Open Burning and the Arctic* (Russia, November 2010), which explored the impacts of emissions from open fires on Arctic climate, particularly black carbon emissions from set fires in Northern Eurasia, provide a critical view of the escalating fire use in the agricultural sector (Clean Air Task Force, 2009; Clean Air Task Force / Bellona, 2011).

3 <http://www.fire.uni-freiburg.de/programmes/natcon/natcon.htm>

Pressing Issues

Some of the newly arising or recently perceived wildland fire problems in the Eurasian region are strongly related to cultural and industrial heritages and recent changes in the cultural landscapes. The examples given in the following reveal that the most immediate impacts of wildland fires on society are determined by human activities, rather than by nature or climate change. Some of the examples highlight events that have been influenced or generated by policies and politics. While some cases may uncover some unspoken problems, there is no intent to blame or accuse any party, nation or country.

Rural Exodus

The interest and insight into cultural landscape ecology has been driven by the increasingly visible socio-economic changes in the past four decades – notably the rural exodus all over Eurasia, which has resulted in abandonment of traditional land-use methods over wide areas (Dimitrakopoulos and Mitsopoulos, 2005). With the elimination of land cultivation, including traditional burning practices, large areas of Europe are reverting to fallow lands – a process that is associated with ecological succession towards brush cover and forest and an overall loss of open habitats. Besides the loss of valuable biodiversity the fire regimes of abandoned lands are transitioning from fuel-limited to water-limited (Pausas and Fernández-Muñoz, 2011), resulting in an increased wildfire hazard.⁴ This trend is evident in a number of extremely severe wildfires such as in Southern Mediterranean Europe and the Balkans in 2007 (Xanthopoulos, 2008) and Western Russia in 2010 (Goldammer, 2010b). Similarly, the exclusion of fire in natural ecosystems such as northern boreal and sub-boreal coniferous forests in Eurasia has resulted in changing vegetation composition and an increase of wildfire hazard, notably in Central-Eastern Eurasia.

The country with the highest rate of abandoned villages and agriculture is Russia (Ioffe, 2005; Ioffe et al., 2006, 2011). Between 1939 and 1989 the rural population of the USSR declined from 130.2 to 97.7 million. Within the Russian Soviet Federative Socialist Republic (RSFSR) alone the decline averaged 100,000 people per year between 1979 and 1988.⁵ In 2010 alone more than 3,000 villages in Russia became deserted⁶, a development obviously supported by government policy aimed at relocating people from rural areas and impoverished towns to larger metropolitan areas in order to improve living conditions.⁷

4 Recently the consequences of rural exodus on increasing wildfire hazard and occurrence has been investigated and proven for the Western Amazon region (Peru) (Uriarte et al., 2012)

5 Data provided by „Seventeen Moments in Soviet History“: <http://www.soviethistory.org/index.php>

6 See report „Exodus leaves Russia’s villages to ghosts“, published on 30 August 2011 by <http://rt.com/news/rural-russia-dying-villages-411/>.

7 See report „Russia Plans Mass Exodus“, published on 17 November 2010 by <http://www.nodeju.com/5449/russia-plans-mass-exodus.html>.

The consequences of rural exodus in Russia and its neighboring countries of temperate-boreal Eurasia on changing fire regimes have not yet been subject to dedicated research. After the collapse of the former Soviet Union the decreasing support of the agricultural sector by the Russian government resulted in abandonment and fallow of 27 million ha of agricultural lands between 1990 and 2009 (Schierhorn and Müller, 2011). Empirical observations suggest that abandonment of agricultural lands, coupled with uncontrolled succession towards bush encroachment and natural reforestation constitute an increasing wildfire hazard – at least during the transition phase to forest formation. At the same time it seems that intentionally set fire is increasing – to keep agricultural lands open or to dispose of crop residue – with the consequence of uncontrolled wildfires spreading to surrounding vegetation, including forest and peat swamps. Recent studies of agricultural burnings at the global scale (e.g., Korontzi et al., 2006) are revealing the magnitude of occurrence but cannot yet prove long-term changes of agricultural fire regimes in temperate-boreal Eurasia related to the historical and current trend of rural exodus.

Increasing vulnerability of urban and peri-urban populations

The weakening or depletion of the rural work force is another factor aggravating the newly arising fire problems in these cultural landscapes in transition. Abandoned villages, along with those with aging populations are increasingly unprotected. As witnessed in 2010, the risk of wildfires spreading uncontrolled into villages and the resultant damage appears to be becoming a serious problem.

The problems and vulnerabilities of infrastructures and populations neighbouring or interspersed with wildlands have received increasing interest by the Western European research community and led to some policy response.⁸ Many countries have created guidelines and legal instruments obliging owners of properties at risk of wildfire to take precautionary and preventive measures for wildfire hazard reduction, and jurisdictions to enforce these policies (Xanthopoulos, 2004).

Secondary effects of wildland fire, however, have been largely neglected in the past, notably vegetation fire smoke pollution impacts on human health and security. The episode of drought, wildfires and smoke pollution in Western Russia in July-August 2010 revealed the humanitarian problems arising in metropolitan areas from smoke emitted by burning of natural vegetation in the rural landscape as well as through long-distance smoke transport (Goldammer, 2010b).

Other threats have also been largely ignored. Wildfires burning houses, industrial infrastructure, agricultural lands treated with pesticides, fungicides, and fertilizers and fires affecting landfills (residual waste) and other waste (e.g. batteries, radioactive materials) generate substantial amounts of hazardous pollutants (Statheropoulos and Goldammer, 2007; Goldammer et al., 2009). The Frio Fire in the Pinal Mountains near in Arizona, which

8 For comprehensive literature on the wildland-urban fire research, including modeling, see: http://www2.bfrl.nist.gov/userpages/wmell/public.html#sec_publications.

burned between August and October 2011 and assumedly affected an area treated with *Agent Orange* in 1965, fuelled public concerns about the consequences of smoke pollution containing dioxins on human health.⁹

Vegetation fires have the potential to release and transport toxic industrial and agricultural substances that have been previously deposited in ecosystems (Genualdi, 2008).¹⁰ In the case of pesticides and polychlorinated biphenyls (PCBs) these persistent organic pollutants can land in regions where the compounds are now banned – or even in the Arctic, where they were never applied. One of the studies uses satellite imaging of smoke plumes and modeling of air mass trajectories to track the source of pollutants emitted by Siberian wildland fires in 2003 and transported to the Pacific Northwest of the U.S., including dieldrin and alpha-hexachlorocyclohexane (alpha-HCH) (Genualdi, 2008).

Recent research reveals that as a consequence of climate change, mercury deposits previously protected in cold northern forests and wetlands will increasingly become exposed to burning. Mercury is readily released into the atmosphere with fire smoke. Turetsky et al. (2006) quantified organic soil mercury stocks and burned areas across western boreal Canada. It was assumed, that based on ongoing and projected increases in boreal wildfire activity due to climate change, atmospheric mercury emissions will increase and contribute to the anthropogenic alteration of the global mercury cycle and to the exacerbation of mercury toxicity in northern food chains.

Fires Burning on Radioactively Contaminated Terrain

In some countries forests and other lands are contaminated by a variety of hazardous chemical and radioactive pollutants. Wildfires occurring in such contaminated terrain may result in hazardous secondary air pollution. The territories most affected by radioactive pollution are those contaminated with radionuclides released during the failure of the Reactor Number Four of the Chernobyl Nuclear Power Plant in 1986. Among the total 6 million ha of radioactively contaminated terrain in Ukraine, Belarus and Russia, the most polluted forest area covers over 2 million ha in the Gomel and Mogilev regions of Belarus, the Kiev region of Ukraine, and the Bryansk region of the Russian Federation. The main contaminant is reported as caesium-137 (¹³⁷Cs) but in the core zones of contamination strontium-90 (⁹⁰Sr) and plutonium-239 (²³⁹Pu) were also found in high concentrations. Under average dry conditions the contaminated surface fuels – the grass layer and the surface layer of peatlands – are consumed by fire. Most critical is the situation in peat layers, where radionuclides are deposited. The long-range transport of radionuclides lifted in the smoke plumes of wildfires

9 EPA Study finds Agent Orange Dioxins in Pinal Mountains. Hazardous? You decide”, published on 15 October 2011 by <http://www.examiner.com/public-policy-in-mesa/epa-study-finds-agent-orange-dioxins-pinal-mountains-hazardous-you-decide> and extracts in the GFMC repository http://www.fire.uni-freiburg.de/media/2011/10/news_20111015_us2.htm

10 See also summary report “Forest fires could spread pollutants”, released by www.usnews.com on 3 December 2009, available at GFMC repository: http://www.fire.uni-freiburg.de/media/2009/12/news_20091204_us2.htm.

and their fallout on large areas were investigated in detail in 1992 (c.f. review by Goldammer et al., 2009b). A recent study presented at the conference “Twenty-Five Years after Chernobyl Accident: Safety for the Future” (Kiev, Ukraine, 20-22 April 2011) concluded that radioactive fallout from a large forest fire occurring in the Chernobyl Exclusion Zone could affect the food chain and thus be considered threat to human health and security (Hohl et al., 2012; see also chapter 18 of this White Paper).

Wildfires Collateral Damages during Armed Conflicts

Fires occurring during or after armed conflicts or during political unrest constitute a major humanitarian and security issue. The history of fire use as a weapon during wars is as long as the history of armed conflicts of humankind (Pyne, 1995). In World War I the Turkish Army burned extended areas in the Rhodopi mountains of Bulgaria to clear the vegetation cover and the hideouts of the Bulgarian resistance fighters (Müller, 1929); in 1922 Greece suffered large wildfires due to similar reasons (Xanthopoulos, 2010). Most prominent examples of fire use in the 20th Century were the attempts by conflicting parties during World War II to ignite the enemy’s hinterland forests in order to distract its military operations. More than 9,000 balloon-carried incendiary devices were launched by the Imperial Japanese Army in 1944 and 1945 (operation *Fusen Bakudan*) to be carried by the high-altitude jet stream to North America, with several hundreds reaching U.S. airspace and soil (Webber, 1975). The Allied Forces on the other hand sent more than 53,000 balloon-carried incendiary devices to ignite forests in Germany at the late stage of the war (Peebles, 1991). In Greece German military forces ignited forests in Central Greece (Pertuli, Thessaly) to drive out members of the resistance movement (Xanthopoulos, 2010). The war in Viet Nam in the 1960s did not only involve large-scale chemical spraying to defoliate forests to destroy the cover of the Viet Cong (“Operation Ranch Hand”), but the Military Assistance Command-Vietnam (MACV) also ordered “Operation Pink Rose“, which attempted (in vain) to burn herbicide-treated forests and the hideouts of the enemy forces (Shapley, 1972; Westing, 1975; Lewis, 2005).¹¹

Most recent occurrences of wildfire during armed conflicts cannot clearly be assigned to intentional tactical or strategic intentions. Most of the fires highlighted in the following are rather collateral damages during conflicts, or fires that were otherwise started at times of armed conflict. Warring parties often used wildfires as an opportunity and reason for mutual accusations. The most recent conflict-related wildfires occurred mainly in the South Caucasus, Near East and the Central Asian Hindu Kush regions.

South Caucasus: The Nagorno-Karabakh conflict (2006): During the period of June to September 2006, extended wildfires affected territories situated close to the Line of Contact (LoC) in and around the Nagorno-Karabakh region. Countries involved in the unresolved conflict around Nagorno-Karabakh accused each other of having ignited the fires intentionally. The fires affected large areas of abandoned lands around the LoC as well as adjoining ag-

11 See a review of the emerging field of warfare ecology by Machlis et al. (2011).

gricultural and forest lands. Impediments to controlling the fires included the threat of landmines and unexploded ordnance, as well as ongoing tensions between armed forces along the LoC. Concerns over the fires in the affected territories resulted in the UN General Assembly Resolution A/RES/60/285 “The Situation in the Occupied Territories of Azerbaijan” (15 September 2006).¹² A joint mission of the Organization for Security and Cooperation in Europe (OSCE), the United Nations Environment Programme (UNEP) and the Global Fire Monitoring Center (GFMC), assessed the short- and long-term impacts of the fires on the environment. In his report to the UNGA the OSCE Chairman-in-Office recommended a number of short- to long-term measures aimed at improving fire management capability in the countries concerned and to contribute to peace building in the region (UN General Assembly, 2007).¹³ Between 2007 and 2012 the recommendations were implemented by the GFMC with funding from the Environment and Security (ENVSEC) Initiative¹⁴ and the Secretariat of the Euro-Mediterranean Major Hazards Agreement (EUR-OPA) of the Council of Europe.¹⁵

Afghanistan / Pakistan (2006): In 2006 the armed conflict in the border region between Afghanistan and Pakistan escalated. Afghanistan-based NATO forces entered Pakistan’s airspace from the neighboring Nooristan province. The air raids on two border villages Daroshot and Azo (Arandu) involved dropping of bombs, which ignited wildfires in the surrounding forests.¹⁶

Israel-Lebanon (2006): During the armed conflict shelling, air raids and rocket attacks started numerous fires on the territories of Israel and Lebanon at a time of drought and extreme wildfire risk (Achiron-Frumkin and Frumkin, 2006). In Israel 800 forest fires were induced by rockets (400 of which required response) affecting 1,200 ha of forests (mainly coniferous). In addition about 6,600 ha of nature reserves, national parks and landscapes proposed as nature reserves, as well as ca. 7,000 ha pasture lands were burned. In Lebanon

- 12 UNGA Resolution A/RES/60/285 “The Situation in the Occupied Territories of Azerbaijan”: <http://www.fire.uni-freiburg.de/GlobalNetworks/SEEurope/UNGA%20Resolution%207%20September.pdf>
- 13 61st UN General Assembly Session, Agenda item 17 „The situation in the occupied territories of Azerbaijan“, Letter dated 20 December 2006 from the Permanent Representative of Belgium to the United Nations addressed to the Secretary-General: <http://www.fire.uni-freiburg.de/GlobalNetworks/SEEurope/N0720860-OSCE-UNGA-ENG.pdf>
- 14 The Environment and Security (ENVSEC) Initiative transforms environment and security risks into regional co-operation. ENVSEC comprises the Organization for Security and Co-operation in Europe (OSCE), Regional Environmental Centre for Central and Eastern Europe (REC), United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), and the North Atlantic Treaty Organization (NATO) as associate partners.
- 15 The ENVSEC project „Enhancing National Capacity on Fire Management and Wildfire Disaster Risk Reduction in the South Caucasus” is operational since 2008 and includes Armenia, Azerbaijan and Georgia, as well as a regional component on cooperative capacity building in fire management.
- 16 http://www.fire.uni-freiburg.de/media/2006/10/news_20061019_pak.htm

the total area of burned forests was 712 ha and that of burned productive trees was 308 ha.¹⁷ The use of white phosphorous as marker bombs or smoke screens in the Gaza War of 2008-2009 carried a high risk of igniting structural and wildland fires.¹⁸

Georgia (2008): During the armed conflict in Georgia in August 2008 a number of forest fires occurred as a consequence of military activities and caused collateral damages in several sites in the country. According to reports by government authorities and non-government organizations the fires burned between 13 August and the end of August 2008. Starting on 13 August 2008 two forest fires in the Ateni Gorge (Ateni and Ormotsi compartments of the Inner Kartli Regional Forest District) affected around 60 ha of forests. Fires affected approximately 950 ha in the Borjomi Gorge in Samtskhe-Javakheti Region, of which approximately 150 ha of the Borjomi area burned in the buffer zone of the Nedzvi Nature Sanctuary. Several fires also affected two national parks and one nature reserve. Three fires burned within the Borjomi-Kharaguali National Park. A joint mission of OSCE and UNEP to assess the environmental impacts of the conflict in Georgia confirmed the damages caused by fires in Borjomi Gorge and noted that additional areas had burned along the main corridors of combat activities (roads between South Ossetia and Gori Region).¹⁹ Starting in 2009 the ENVSEC programme included Georgia in the above-mentioned regional fire management project.

Asymmetric Conflicts: The Forest Fire Jihad

In November 2008 a website carried the first known posting calling for *Forest Jihad*. According to a U.S. intelligence report published in January 2009 the statement, in Arabic, said that “summer has begun so do not forget the *Forest Jihad*.” The writer called on all Muslims in the United States, Europe, Russia and Australia to “start forest fires”.²⁰ The posting quoted an imprisoned Al Qaida member:

- “*Jihad* is an art just like poetry, music, and the fine arts. There are people that draw and there are others that are *jihadists*. They both act upon inspiration”.
- “The idea of forest fires is attributed to him, may God set him free, as is in this short clip”.
- The posting said that setting forest fires was legal under extremist Islamic law as part of “an eye for an eye” and can produce “amazing results”.

17 Report of Association for Forests, Development and Conservation (AFDC) is archived in the GFMC repository.

18 „Did Israel use a banned weapon?“, published on 22 January 2009 by CBS: <http://www.cbsnews.com/stories/2009/01/22/eveningnews/main4748346.shtml?tag=currentVideoInfo;videoMetaInfo>

19 Report of the Joint OSCE / UNEP Environmental Assessment mission to Georgia (29 September to 3 October 2008): http://www.fire.uni-freiburg.de/GlobalNetworks/SEEurope/OSCE-UNEP-GFMC-Env-Assessment-Georgia-Oct-2008-OSCE-34577_en.pdf

20 “U.S. intelligence alerted to threat of ‚Forest Fire Jihad“”, published on 15 January 2008 by www.worldtribune.com (http://www.worldtribune.com/worldtribune/WTARC/2008/me_terror_01_15.asp, and http://www.fire.uni-freiburg.de/media/2008/01/news_20080117_us2.htm)

- The writer stated that it was permissible to burn trees in carrying out jihad. “Scholars have justified chopping down and burning the infidels’ forests when they do the same to our lands,” the writer said.
- The writer stated that “targeted forests” are in the nations that “are at war with Muslims,” including the United States, Europe, Russia, and Australia.
- “Smoke caused by the fires will create pollution and military forces could be tied up fighting fires”. The report noted that U.S. military forces in Iraq or Afghanistan “could even be recalled” as occurred following hurricane Katrina, which, in fact did not occur.
- The report urges terrorists to use sulphuric acid to start a forest fire, as well as gasoline.

While Australian authorities have revealed no evidence linking any recent wildfires to extremists, terrorism experts say “the large death toll, the huge swath of destruction and the massive financial blow to the country are proving to Islamic terrorists that arson can be a highly effective – and simple – tool of holy war”.²¹

In December 2010 Israel’s police, fire brigades and press intentionally covered up an Arab arson offensive that took place while fires raged on Carmel Mountain on the first week of December 2010, an Israeli media report claimed.²² Police and the Fire Commission decided not to spread the information about the arson “so as not to wake into action more potential terrorists”. The press report listed the locations of about 25 arson attacks that the fire brigades fought in the early days of the month. In November 2010 eighteen acts of arson were recorded in the *Forest of Peace*, the press report noted.

The tensions are reflected by recent events that are not yet finally evaluated. In February 2011 the leader of a major Muslim movement in Israel was arrested for allegedly damaging and setting fire to a eucalypt forest in Southern Israel.²³ The attack was allegedly in protest of a Jewish National Fund project in the area. The Jewish National Fund is working to plant forest on parts of the Negev, a plan opposed by some Bedouin residents of the region. Residents of the town of El-Araqib in particular had condemned the project out of concern that it will use land that they hope to use in the future to house Arabs “returning” to Israel from the rest of the Arab world.

In May 2012 Al Qaida called upon its followers to unleash massive forest fires upon the United States and published graphic instructions for the creation and ignition of “ember

21 „Australian wildfires could fuel ‘Forest Jihad’ terrorists, experts say”, published on 09 February 2009 by <http://www.foxnews.com/story/0,2933,490306,00.html>

22 “Cover up of Arab arson offensive exposed”, published on 15 December 2010 by <http://www.israelnationalnews.com/news/news.aspx/141167>

23 “Islamist leader arrested for forest fire arson”, published on 22 February 2011 by <http://www.israelnationalnews.com/News/News.aspx/142464>

bombs". Detailed in the memorably titled, "It is of your Freedom to Ignite a Firebomb" the call targeted Montana because of its rapid population growth in the wooded areas.²⁴

Later in 2012 the Russian Secret Service FSB claimed to possess information that terrorism tactics of Al Qaida included setting fire to European forests, an allegation which could not be proved.²⁵

The U.S. Department for Homeland Security (DHS, 2012) released an internal note (unclassified but for official use only) "Terrorist Interest in Using Fire as a Weapon" aimed at "providing awareness of terrorist interest in the tactic of intentionally setting fires to cause casualties, economic damage, and resource depletion".²⁶

Civil Unrest and Wildfires

Wildfire outbreaks have also occasionally been attributed to domestic civil unrest in some countries. Kailidis (1992) intended to prove that wildfires in Greece were started purposely during times of elections and political crises between the 1920s and 1980s. Xanthopoulos (2010) rejected this direct link of high-fire occurrence years with political unrest and attributed the underlying causes to poor performance of government agencies. In this regard he also rejected the hypotheses developed by Christodoulakis and Skouras (2009), who developed theories suggesting that around elections, wildfires and tax evasion increase significantly in Greece, with important economic implications. However, Xanthopoulos (2010) confirmed the use of fire during the civil war between the nationalistic and communist movements.

Political motivations and accusations for arson can hardly be proven, for example blaming the ETA in Spain or the Mafia in Italy for political arson (Xanthopoulos, 2010). However, there is occasional evidence indicating such motivations such as the series of arson fires in and around Athens (Greece) in 1981. In August 1981 the right-wing movement *Galazios Toxotis* ("Blue Archer") was accused having lit fires in the residential area *Nova Politeia* of Athens – home to many political leaders, as well as trying to blackmail the government into releasing political prisoners (members of the former military junta).²⁷

24 „Unleash Hell: New Al Qaeda magazine describes in detail how to start huge forest fires across the U.S. with instructions on how to make ‘ember bombs“, published on 3 May 2012 by <http://www.dailymail.co.uk/news/article-2138758/Unleash-Hell-New-Al-Qaeda-magazine-describes-start-huge-forest-fires-U-S-instructions-make-ember-bombs.html>

25 „Forest Jihad: Al-Qaida Turns to Eco-Terrorism says Russian Security Chief“, published on 3 October 2012 by <http://www.ibtimes.co.uk/articles/390777/20121003/russia-terrorists-forest-jihad-alexander-bortnikov-al.htm>

26 For more information on the concept of „pyro terrorism“ see Baird (2006) and Deshpande (2009)

27 „Blauer Bogenschütze. Der Großbrand, der Athen bedrohte, ist anscheinend das Werk von Rechtsextremisten, die ihre Idole aus dem Gefängnis pressen und das Volk kurz vor den Wahlen in Unruhe versetzen wollen“, published on 10 August 1981 by <http://www.spiegel.de/spiegel/print/d-14335960.html>

A case of collateral damages of civil protest involving wildfires has been noted during demonstrations in Israel in May 2010 when brush fires started by tear gas canisters were fanned by the wind and engulfed the land in a massive brushfire.²⁸ In June 2011 Jewish settlers were accused of setting fire to fields belonging to Palestinian inhabitants of the West Bank village of Burin.²⁹

It is alleged that in December 2011 former Turkish Prime Minister Mesut Yilmaz officially admitted that Turkish secret agents intentionally started forest fires in Greece in the 1990s as part of state-sponsored sabotage. This followed earlier claims that the blazes were a retaliation for Greece's alleged hosting of training camps for Kurdish rebels of the Kurdistan Workers' Party (PKK) and urban underground leftist group Devrimci Sol and even a retaliation for forest fires in Turkey's tourism areas during the 1990s allegedly set by Greek secret service agents.³⁰

Wildfires and other Remnants of Armed Conflicts: Land Mines and Unexploded Ordnance (UXO)

The countries in the region most affected by land mines are Bosnia and Herzegovina, Croatia, Serbia, Macedonia, Georgia, Ukraine, and Armenia. The origin of the land mines and unexploded ordnance (UXO) in Bosnia and Herzegovina, Croatia and Serbia is from the civil war from the last decade of 20th century. It is estimated that about 300,000 ha are contaminated by land mines and UXO (mostly along to the line of conflict during the civil war). According to a report from Bosnia and Herzegovina about 127,000 ha of forests, or 10% of the total forest lands, are contaminated by UXO and land mines (Pešković, 2008). Croatia reports 95,000 ha of mined forests and other lands with a total of ca. 100,000 land mines left (Jungwirth, 2009). This is a significant problem and challenge for forest fire management since wildfires burning on mined lands cannot be fought on the ground using conventional equipment. Wildfires triggering explosions of land mines have caused casualties in several cases and resulted also in reluctance to attack wildfires, or in orders for firefighters to stay out of the "red zones". In Vietnam UXO stemming from the war in the 1960s and

28 „An Nabi Saleh demonstrates against violence in the midst of extensive brushfires”, published on 16 May 2010 by www.palsolidarity.org and http://www.fire.uni-freiburg.de/media/2010/05/news_20100516_ps.htm

29 „Settler arson attack in the village of Burin”, published on 30 June 2011 by <http://palsolidarity.org/2011/06/19146/>

30 At the time of finalizing this chapter the debate on false quotations and accusations are ongoing, see GFMC Media repository of December 2011 (http://www.fire.uni-freiburg.de/media/2011/12/news_december11.htm), notably see: http://www.fire.uni-freiburg.de/media/2011/12/news_20111228_gr.htm.

1970s continue to trigger wildfires and posing threats to firefighters more than 35 years after the termination of the armed conflict.³¹

Similar reports from the Line of Contact (LoC) between India-Pakistan in Jammu and Kashmir reveal that landmines are the main hindrance in controlling forest fires. There are reports of incidences in July and December 2009 and May 2011 of land mines laid along the LoC exploding during wildfire.³² In Israel, wildfires in minefields on the Golan Heights threatened a UN peacekeeping battalion in August 2009.³³ In Turkey about one million land mines have been laid between the 1950s and the early 1990s. In the border region between Syria and the Turkish province Sanliurfa about 14,000 ha of productive agricultural land have been mined as a strip along the border. These areas with land mines pose a great danger in fire suppression (Bilgili, 2009).

Ironically land mines may also protect forests from destruction by non-sustainable or illegal use. The Global Fire Monitoring Center (GFMC) assessed the wildfire threats inside and around Quadisha Valley, Lebanon, which has been UNESCO World Heritage listed since 1998. The Joubbeh-Bcharri community forest at the edge of Quadisha Valley contributes to the few large forest tracts in Lebanon which have not yet been subjected to illegal cutting, occupation by constructions or other degradation. The reason for this lies in the contamination of the forest by land mines, which had been laid by Syrian and Lebanese troops during the civil war (1975-1990). These mine fields have not yet been cleared, thus people are not entering the forest. Grazing by goats is common around the edge of the forest complex and contributes to reduced fuel loads and thus decreased risk of wildfire spreading into the forest. The technical report to UNESCO concludes that land mines and goats so far have protected the forest from degradation (Global Fire Monitoring Center, 2010).

Unexploded Ordnance (UXO) is found on several hundred thousand hectares of forests and other lands throughout Western, Eastern and Southeastern Europe. Remnants of World War I battles along the frontlines of 1917 in the South of today's Former Yugoslav Republic of Macedonia have repeatedly created problems, e.g. during the fire season of 2007 when more than 70 incidents of explosions of ammunition triggered by forest fires

31 „Danang: Nearly 100ha of pine forest burnt down”, published on 3 May 2012 by <http://english.vietnamnet.vn/en/society/21890/danang--nearly-100ha-of-pine-forest-burnt-down.html> and http://www.fire.uni-freiburg.de/media/2012/05/news_20120503_yn2.htm

32 „Landmines explode, hamper efforts to put out spreading LoC forest fires”, published on 9 July 2009 by www.kashmirlive.com and http://www.fire.uni-freiburg.de/media/2009/07/news_20090710_in.htm; „Bushfire sets off 6 landmines in Poonch“, published on 13 December 2009 by Rising Kashmir: http://www.risingkashmir.com/index.php?option=com_content&task=view&id=19095&Itemid=1; „Forest fire damages LoC minefield, explosions trigger panic”, published on 17 May 2011 by <http://in.news.yahoo.com/forest-fire-damages-loc-minefield-explosions-trigger-panic-152300779.html> and http://www.fire.uni-freiburg.de/media/2011/05/news_20110517_in.htm

33 „Feueralarm: Grasbrände in der Zone“, published on 3 August 2009 by the Austrian Army <http://www.bundesheer.at/ausle/undof/artikel.php?id=2893>

were noted (Goldammer and Nikolov, 2007). In Germany, the battlegrounds of the final phase of World War II in Brandenburg State around Berlin are still highly contaminated by approximately one hundred thousand tons of unexploded artillery, grenades and bombs. In addition, former and active military exercise areas and shooting ranges dating from the early 1900s to post-World War II, pose a high risk to civilian populations, especially firefighters (Goldammer, 2010; Goldammer et al., 2009). A recent estimate reveals that ca. 250,000 ha of former and active military training and shooting ranges in Germany are contaminated by UXO.³⁴

Besides the above-mentioned land mine contamination in the Balkans and the South Caucasus the combat grounds in and around the Nagorno-Karabakh territory represent one of the major UXO-polluted terrains worldwide. In the Near East the aftermath of the Israel-Lebanon War of 2006 revealed numerous problems associated with unexploded cluster bombs. The National Demining Office of Lebanon reported 22 fatalities and 166 injuries due to post-conflict explosions of cluster bombs; two incidents occurred during wildfire suppression.

Similar risks are found in other continents. For example in Australia, where large tracts of lands are contaminated by World War II explosives, nearly 40,000 blocks of land across Brisbane and Ipswich on which UXO had reportedly exploded during bushfires.³⁵

Threats arising from Wildfires Affecting Military Assets

Wildfires have the potential to affect other military assets, including ammunition depots, nuclear and conventional research and storage facilities, and active military shooting and exercise ranges. Forest fires have entered ammunition storage facilities in the territories of the former Soviet Union in recent years. In 2008 artillery shells and other ammunition at a storage facility in Ukraine exploded when a forest fire swept into the depot.³⁶ Details of the causes of other reported incidents remain unclear; a fire and subsequent explosions at a munitions depot in southern Ukraine in 2004 killed five people; a fire at a Soviet-era military base in Kagan, Uzbekistan spread to an ammunition depot in July 2008, also igniting a series of explosions that killed three people and injured 21 others; and a fire that burnt an arsenal near Ulyanovsk (720 kilometers east of Moscow) in November 2009.³⁷ The latest

34 This assessment of January 2011 has been extracted from the databank „Nature Conservation and Military“, David Foundation, Germany (unpublished data on file at GFMC). See also Goldammer et al. (2012).

35 „Buried bomb risk worsened by bushfires: councilor“, published on 1 October 2009 by www.brisbanetimes.com.au and http://www.fire.uni-freiburg.de/media/2009/10/news_20090910_au3.htm

36 „Blaze sweeps Ukraine military base“, published on 29 August 2008 by <http://english.aljazeera.net> and http://www.fire.uni-freiburg.de/media/2008/08/news_20080830_ukn.htm

37 „Blasts rock Russian ammunition depot, 2 killed“, published on 15 November 2009 by Associated Press and http://www.google.com/hostednews/ap/article/ALeqM5hw4_DV-6Y-iKHHHg-sUKdvh92XIRAD9BUSIVGO

incident of this kind resulted in a large ammunition depot fire in Russia, which was attributed by some to be caused by a wildfire and which burned in May 2011 nearby the village of Urman (Bashkortostan).³⁸

During the fire and smoke pollution episode in Western Russia in July/August 2010 several military depots and nuclear facilities were threatened by fire. In the first week of August wildfires overran a weapons storage facility near Moscow (the Central Air and Technical Naval Base 2512), with an estimated loss of 200 airplanes and half of the buildings destroyed. At the same time the Russian military garrison Naro-Fominsk near Moscow moved all its artillery ammunition and rockets to a safer location as wildfires advanced in the region. In the same week wildfires threatened a factory in Kolomna that produces guided missiles, the Novovoronez nuclear power station near Voronez and the Tryokhgornyy nuclear closed city in the Urals (Soviet code name: Zlatoust-36) where nuclear warheads are assembled and dismantled.³⁹ A critical situation developed in the closed „nuclear city“ of Sarov (Arzamas-16) as wildfires advanced towards nuclear arms-producing facilities.⁴⁰

Similar incidences have affected other continents – for example in the U.S.A, where the Los Alamos nuclear weapons laboratory – located 70 miles north of Albuquerque (New Mexico) and employing 7,000 people – was threatened by wildfires in May 2000. The fires burned within 300 yards of a plutonium storage facility and forced the evacuation of more than 20,000 people from the main and an adjoining the facility.⁴¹ A similar situation arose during the *Las Conchas Fire* in June / July 2011. This fire once again threatened the Los Alamos nuclear facility and spread fears of radioactive contamination (O’Brien and Goldammer, 2011).

In South Europe the most recent severe accident on a military site was caused by a wildfire in Cyprus, which occurred on an ammunition storage site and became the most disastrous recorded event in that region. On 11 July 2011 a brush fire triggered the explosion of the Iranian explosives that had been confiscated in 2009 and stored at the munitions dump of Evangelos Florakis naval base in Zygi. Two containers caught fire and a series of explosions followed. The blast killed six base personnel and six fire fighters who were battling the bush fire that preceded the explosion. More than 60 people were injured. Severe damage to the island’s biggest power station – Vasiliko, which supplied about 60% of the island’s electricity – resulted in severe power supply shortages (O’Brien and Goldammer, 2011).

38 „Unknown cause for Russian arms depot fire“, published on 27 May 2011 by Euronews, see <http://www.euronews.net/2011/05/27/unknown-cause-for-russian-arms-depot-fire>

39 http://www.fire.uni-freiburg.de/GFMCnew/2010/08/06/20100806_ru.htm

40 For a detailed situation description and a map of Sarov and surroundings, with active fires, depicted by WorldView-2 satellite sensor (2-m resolution), on 6 August 2010, see: http://www.fire.uni-freiburg.de/GFMCnew/2010/08/07/20100807_ru.htm.

41 http://www.fire.uni-freiburg.de/media/2003/news_05122000_1.htm

Military Training and Wildfires

Military activities on training and shooting ranges are common in Europe. In 2009 and 2010 extensive fires burned near the suburbs of Marseille (France) as a consequence of exercise shelling by the Foreign Legion. In July 2009 more than 300 people were evacuated from their homes when fires caused by shelling became uncontrolled.⁴² Similar experiences have been shared by countries in other continents. In the U.S.A. the “Machine Gun Fire” of September 2010 burned through the training range of Camp Williams, Utah. It was caused by automatic weapons training and affected the artillery impact area with UXO contamination, consuming 4,326 acres and three houses and forcing the evacuation of 1,652 houses and nearly 5,000 people.⁴³ In the extremely dry spring months of 2011 extensive fires caused by military shooting exercises in the training grounds of Fort Lee, White Sands Missile Range, Fort Bliss and Camp Pendleton were recorded.

The presence of UXO constitutes a considerable threat to land management authorities, ground firefighters and aerial fire suppression. Within this broad category of UXO, the threat of residual exercise ammunition is less than the risk of residual combat ammunition. In Germany fire services are not allowed to fight wildfires on demarcated terrain contaminated by UXO (“red zones”). Thus, as wildfires cannot be attacked swiftly and with conventional means there is high threat of fires becoming out of control and spreading to adjacent terrain.

Opportunities and Challenges of maintaining Military Training Ranges of high Conservation Value

In Europe active and former military training areas and shooting ranges have been shaped by wildfires in such a way that open land ecosystems of high biodiversity value have been created or maintained by recurrent fires. The Atlantic and continental *Calluna vulgaris* heathlands of Germany are a classic example of sub-climax ecosystems that historically had been maintained by intensive cultivation (grazing, mowing, biomass export) and intentionally or accidentally lit fires on military training grounds. In the wake of demilitarization at the end of the Cold War and the unification of Germany the 1990s and into the first decade of the 21st Century, the use of former military ranges was largely abandoned, and subsidized maintenance of open land habitats has reached critical limitations due to lack of appropriate policies and funding prioritization (Goldammer et al., 2009). The recent introduction of prescribed fire in Germany to maintain open heathland habitats is based on traditional

42 „Imbeciles’: Hundreds evacuated from their homes as bushfire caused by French military threatens Marseille”, published on 23 July 2009 by www.dailymail.co.uk and http://www.fire.uni-freiburg.de/media/2009/07/news_20090723_fr.htm

43 „Utah National Guard admits fault in Machine Gun, Camp Williams Fire“, published on 20 September 2010: http://www.fire.uni-freiburg.de/media/2010/09/news_20100920_us5.htm and http://www.fire.uni-freiburg.de/media/2010/09/news_20100920_us6.htm and http://www.fire.uni-freiburg.de/media/2010/09/news_20100921_us.htm

burning practices and coincides with new ecological insights of applied fire research that are receiving increased acceptance from nature conservation groups and the public. The above mentioned *White Paper on Use of Prescribed Fire in Land Management, Nature Conservation and Forestry in Temperate-Boreal Eurasia* (Goldammer, 2010a) is indeed calling for a widespread application of prescribed fire to maintain the conservation value of former military training sites.

The presence of UXO, however, is a limiting factor for the application of prescribed fire on approximately 250,000 ha of high conservation value terrain (Fig. 1). A pilot project is currently underway in the Heidehof-Golmberg Nature Reserve in the State of Brandenburg, Germany, to test safe application methods of using armored vehicles (demilitarized tanks) for prescribed fire ignition and control. Monitoring and control of the fire operations by an unmanned aerial system (helicopter drone with real-time video downlink to the control center) allows navigation and safe and efficient ignition and control of the armored vehicles (Goldammer et al., 2012).

Overall Global Wildland Fire Fatalities

Reliable global statistics on wildland fire fatalities (deaths and injuries) are not available. A major share of wildfire fatalities are occurring in developing countries and are not entering the electronic media or insurance statistics, and thus are not available for international evaluation. Injuries caused by indirect effects of fire are common but not systematically evaluated, e.g. short- to long-term effects of fire smoke pollution on human health, including premature mortality. Fire and smoke episodes in Southeast Asia and the Amazon lowlands caused by conversion burnings since the 1980s have sparked numerous media reports on such massive near-ground smoke pollution and the resulting threats and observations of people adversely affected by smoke inhalation, but only very few scientific investigations have been conducted (for details cf. chapter 18 of this volume).

Since 2008 annual global wildland fire fatalities reports are published by GFMC.⁴⁴ The reports reveal that 345, 374, 279 and 130 people were killed directly by wildfires in 2008, 2009, 2010 and 2011 respectively. The 2010 report does not include fatalities that could be possibly attributed to the consequences of the extreme heat wave and extended fire smoke pollution in Western Russia (cf. final remarks in chapter 18 of this volume).

⁴⁴ http://www.fire.uni-freiburg.de/media/bulletin_news.htm. Starting with the 2011 report data will be provided on structures and other economic assets burned and damaged, as well as numbers of evacuations and evacuees.

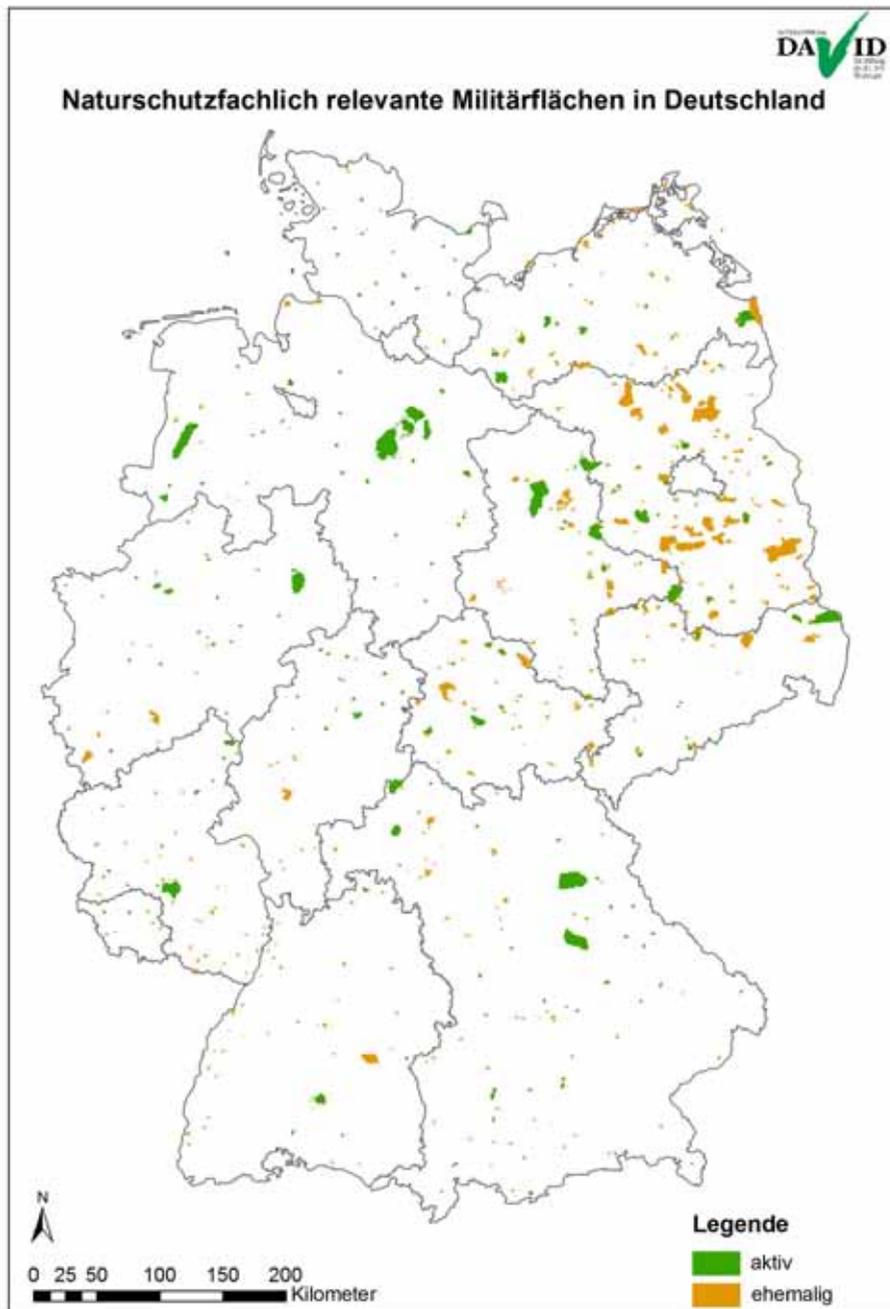


Figure 22.1. Germany has about 700,000 ha active or former military exercise and shooting ranges with high conservation value. About 250,000 ha of these lands are contaminated with Unexploded Ordnance (UXO). Source of map and contamination assessment: Naturstiftung David, Germany (Goldammer et al., 2012). Legend: green – active military areas; ochre – abandoned military areas.

The reports also include persons injured and – starting in 2011 – the extent of structural damages caused by wildfires and evacuations due to wildfire threat.⁴⁵ As stated by GFMC, the numbers of fatalities and damages include only those reported in the media and 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 fatalities in remote regions of the developing world.

Addressing Politics and Policies

The chapters of this volume – the White Paper – have reflected on the natural and human-influenced history of vegetation fires globally. The individual chapters address a complexity of situations in which fire regimes are changing. Thus, conclusions point various directions, depending on the specific nature of local and regional environmental and socio-economic changes. In the final chapter some considerations about options of how to cope with changing fire regimes and fire management in future will be given. In the context of the questions addressed in this chapter two examples are selected to highlight the need for action: Wildfires as means or consequences of armed conflicts or strained political relations, and the prevention of dangerous wildfires on contaminated terrain.

Opportunities: Confidence Building for Human Security and Peace

Since wildfires and vegetation fire smoke can easily spread over boundaries, thus making fire management become an additional source of contention to already strained relations between neighbouring countries. Hence, because of the transboundary nature of wildfires and their potential impact, co-operating on fire management across borders is in the interest of all sides involved. Thus, like water management, fire-management has great potential to be a source of co-operation and an avenue for confidence-building.

The most recent events during a state of high tension between countries, or state of war, were the above-mentioned situations around the Nagorno-Karabakh conflict in 2006 and the armed conflict in Georgia in August 2008. Mandated by the UN Security Council in 2006 and by the Organization for Security and Cooperation in Europe (OSCE) the Global Fire Monitoring Center (GFMC) was entrusted with the technical lead to develop confidence building measures between countries directly and indirectly affected. The proposed measures of building national and transboundary fire management capacity are aimed at

45 According to the 2011 report a total of 125 evacuations in 15 countries involved the temporary displacement of 85,723 persons. The loss of private homes destroyed by wildfires in 2011 in 15 countries amounted a total of 7193. The number of homes damaged by wildfires in three countries amounted 269. Farmers lost more than 9800 livestock in six countries, more than 700,000 ha of valuable agricultural lands were affected by wildfires and were considered destroyed. Estimated agricultural loss in South Africa was \$US 7.16. Only in Texas, U.S.A., wildfires during April have caused an estimated \$20.4 million in agricultural losses, destroying fences, buildings, grazing pastures and resulting in livestock deaths.

managing and preserving natural assets and protecting populations from adverse impacts of fires. They were implemented starting in 2007 (ongoing) within the framework of the OSCE Mission and the Project “Enhancing National Capacity on Fire Management and Wildfire Disaster Risk Reduction in the South Caucasus”, which comes under the umbrella of the ENVSEC Initiative.⁴⁶ Following the OSCE report to the UN General Assembly on the Nagorno-Karabakh mission in 2006, in which was stated “The Mission’s hope is that, further to its recommendations, fires might be transformed from an additional source of conflict into an opportunity for regional co-operation, confidence building and ultimately reconciliation” (UN General Assembly, 2007) the OSCE considers the ongoing project as one of the successful non-military confidence building measures in the region.⁴⁷

In December 2010 a wildfire affected the Mount Carmel massive near Haifa, Israel, resulting in a relatively short, but intense and dangerous inferno of planted, partially exotic tree stands and natural vegetation on the slopes of the mountain. Given the scarcity of forests in Israel, the high emotional value of the fire, and the tragic loss of 42 human lives entrapped by the fire, the country received a widespread response of assistance to combat the fire, including the provision of aerial firefighting resources from as far as the U.S.A. and Russia.⁴⁸ Most significant, however, was the assistance of Palestinian authorities by sending fire trucks and crews for support of fire suppression, despite fierce political tensions between the parties. On 7 December 2010 the President and the Prime Minister of Israel signed a letter of recognition, in which “The State of Israel expresses its gratitude and deep appreciation to the Special Delegation of the Palestinian Authority for the invaluable contribution and exemplary courage in battling the blaze of Mt. Carmel”.⁴⁹

During the Mt. Carmel fires in December 2010 Turkey assisted with massive firefighting support, despite the tensions between the countries that had earlier arisen from the incident on a Turkish ship bound for Gaza and seized by Israeli military, which resulted in the deaths of nine Turkish citizens in May 2010.⁵⁰

In July 2011 a wildfire threatening the Yad Vashem holocaust memorial in Jerusalem was controlled with the assistance of Arab staff from East Jerusalem, who significantly contributed to save the archives.⁵¹

46 See section “Pressing Issues” above.

47 OSCE Guide on Non-Military Confidence Building Measures (2012): <http://www.fire.uni-freiburg.de/GlobalNetworks/SEEurope/OSCE-Guide-CBM-Measures-2012-Extract-Fire.pdf>

48 For a real-time log on the Mt. Carmel fires see GFMC daily updates archives at: <http://www.fire.uni-freiburg.de/current/archive/archive.htm#ISRAEL>.

49 Copy of letter available at GFMC repository.

50 http://en.wikipedia.org/wiki/Gaza_flotilla_raid

51 „Yad Vashem praises Arab staff for fighting Jerusalem Forest fire“, published on 20 July 2011 by <http://www.haaretz.com/print-edition/news/yad-vashem-praises-arab-staff-for-fighting-jerusalem-forest-fire-1.375644> and http://www.fire.uni-freiburg.de/media/2011/07/news_20110728_il.htm

In October 2011 rabbis from the United States of America thanked envoys from countries that helped Israel douse forest fires, “including some that now have difficult relations with the Jewish state”, including a Palestine Liberation Organization envoy.⁵²

Starting an international dialogue on Dangerous Fires on Contaminated Terrain

In 2009 an international seminar made history by addressing the problem of “Wildfires and Human Security: Fire Management on Terrain Contaminated by Radioactivity, Unexploded Ordnance (UXO) and Land Mines”. The seminar was held in Kyiv and Chernobyl, Ukraine, and provided new insights into phenomena and problems arising from fires burning in radioactively contaminated terrain in the Eurasia biota. Most severe problems are in the territories of Ukraine, Russia, and Belarus, which were highly contaminated by the failure of Reactor 4 of the Chernobyl Nuclear Power Plant back in 1986. Traces of radioactivity are found in emissions from wildfires burning in Central Asia and are transported long-range and intercontinental. Wildfire incidents in the U.S.A. have threatened nuclear test facilities but so far have not resulted in severe contamination.

Reports from Germany, the Southern Caucasus countries Armenia and Azerbaijan, the Near East countries Lebanon and Israel and the Balkan countries Bosnia and Herzegovina, Croatia and FYROM Macedonia reveal the magnitude of unexploded ammunition and land mine contamination in forested and other lands and the problems associated with remnants from armed conflicts dating back as far as World War I. Reports on fires burning in former military exercise and shooting ranges reveal that unexploded ordnance are potentially very dangerous and have repeatedly resulted in firefighter casualties.

The seminar called on its host – the government of Ukraine – and the auspices of the seminar, the Global Fire Monitoring Center (GFMC), the Council of Europe (CoE), OSCE / ENVSEC, the UNISDR Regional Southeast Europe / Caucasus and Central Asia Wildland Fire Networks, and the UNECE / FAO Team of Specialists on Forest Fire to address the problems. The “Chernobyl Resolution on Wildfires and Human Security: Challenges and Priorities for Action to address Problems of Wildfires burning on Terrain Contaminated by Radioactivity, Unexploded Ordnance (UXO) and Land Mines“ recommends to develop policies and practices related to fire management on contaminated terrain.⁵³

Conclusions

Without intending to repeat the historic role of fire use in the evolution and maintenance of the cultural landscapes and land-use systems of temperate-boreal Eurasia (e.g., Goudsbloom, 1993; Pyne, 1997; Goldammer et al., 1997), and the subsequent changes due to the

52 „Rabbis thank countries that helped with forest fires” published on 25 October 2011 by <http://www.jta.org/news/article/2011/10/25/3089956/rabbis-thank-countries-that-helped-with-forest-fires> and http://www.fire.uni-freiburg.de/media/2011/10/news_20111025_il.htm

53 See summary of seminar contributions and the Chernobyl Resolution published in UNECE / FAO International Forest Fire News (IFFN) No. 40 (2010), pp. 76-113.

takeover of using fossil-fuel driven technologies replacing traditional cultivation systems including fire use, it seems that the cultural landscapes of the region are on the brink of an era of transition.

While the rural exodus may offer opportunities for natural revegetation – a process welcomed by those supporting the transformation of former cultivated or otherwise intensively used lands to natural vegetation or “wilderness” areas – large tracts of cultivated landscapes are transitioning to a state of high wildfire hazard and wildfire risk as a consequence of vegetation succession and buildup of combustible materials readily susceptible to ignition and spread of wildfires.

This coincides with an obviously increasing vulnerability of society to fire and fire effects – a trend that is observed in other cultural landscapes around the world. New approaches in integrated land management are needed, ranging from small-scale approaches aimed at preserving or managing habitats of endangered species to landscape-scale approaches that take into account the overarching aspects of landscape functioning, environmental protection and climatic changes.

With increasing knowledge on the adverse effects of fire smoke emissions on human health, biogeochemical cycles and direct and indirect effects on climate, it may be expected that conflicts between the need for natural and cultural fires and the need to protect an increasingly vulnerable human society will become apparent.

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Note: Media reports quoted in footnotes and mirrored in the GFMC global wildland fire data repository can be accessed using a User ID and a Password, which will be made available on request by GFMC. Enquiries to be address to: fire@fire.uni-freiburg.de

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