
UKRAINE COUNTRY FOREST FIRE 2007 REPORT**SERGIY ZIBTSEV**

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sergiy.zibtsev@nauu.kiev.ua**1. Assessment of fire situation in Ukraine****1.1 Number, area and types of forests and other vegetation affected by fire**

Number and area of wildfires, including forest fires in Ukraine is characterized by steady tendency to increase during last 25 years (fig. 1). In particular, if during 80th number of fires varied from 792 up to 2377 cases per year, in 90th - this parameter has increased twice and more - from 1818 up to 6743, and remained at a level 3205 - 6383 fires per year during 2000 - 2007 (data on 2007 is preliminary) (tab. 1).

The area of fires for the mentioned periods increased even with higher rates: 286 - 2887 hectares annually in 80th years, 579-10982 in 90-ties, and 621 - 10000 in 2000-2007. Considering more or less proportional growth of areas and numbers of fires during this period, the mid-annual area of a fire was relatively stable and did not exceed during the majority of years of 1 hectare. The low mid-annual area of a fire can reflect high efficiency of detection and response of fire fighting forces to fire, fast delivery of engines and forces for suppression and localization of the of fire at an initial stage. On the other hand, the low middle-area of fires can be result of underestimation of the actual areas of fires. It is common, that if area of burned forests in certain forest enterprise higher than averages on the region, it is often perceived by controls bodies as a feature of the unsatisfactory organization of fire management that induces to a certain understating of statistical characteristics of fires. Data on number of fires, probably, better correspond to a real picture, than the areas of fires. Such peculiarities of statistical data reduce efficiency of the analysis, especially concerning definition of the centers of burning, and also do not allow estimating precisely needs for technical and financing support of fire management in certain region. Based on official statistics parameters, area and number of fires per one million hectare of the forests reached 0,33 that does not differ essentially from neighboring countries of the East Europe.

Nation wide average indices of fires do not display an acuteness of the problem in regions of the country, which are very different by climate. Among five natural-climatic zones that allocated for territories of Ukraine, two are mountain (the Ukrainian Carpathians and the Crimea) and three are flat - the Ukrainian Polissia (Forest zone), forest-and-steppe and steppe zones. Within the last three ones east and west sub zones are allocated, which differs essentially by a climate. In the majority, fires happen most often in Scotch pine forests and much less often - in spruce, fir or larch forests. Scotch pine semi-natural forests (of artificial origin) are widespread, practically, across all Ukraine: as a massive forests in the North of the country (the Ukrainian Polissia), and as a belt of forests along the greatest rivers stretches from the north to the south. Considerable part of those Scotch pine forests grows out of borders of natural habitats. More than half of pine forests in Ukraine which are created artificially and presented by young and middle-aged monocultures are characterized by the greatest fire danger.

Together with increase of number and area of fires during last decades, the share of crown fires areas increased also. If in 80-ties the share of crown fires area made less than 40 % from all area of fires, since 90th years this share has increased at a level 45 - 55 % (fig. 2) that reflect increase intensity of fires. The essential contribution is brought with crown fires in the South of Ukraine. In particular, the share of crown fires in Kherson oblast for last 26 years in 1,5-2 times exceeded a similar nation wide parameter across Ukraine (fig. 3). It is caused both by higher natural fire hazard of Scotch pine plantations and also unfavorable fire weather in the South. In long run, in conditions of expected of climate drying of the region due to global climate changes, there is a high probability of increase of fires in the South of Ukraine. This requires prioritizing of all activity on improvement of fire management in the region.

Table 1. Total area burned and number of fires in Ukraine during 1981 – 2007 years

Indicators	81	82	83	84	85	86	87	88	89	90	91	92	93	94
Total area burned SFC, ha	648	286	1541	2887	485	1403	522	806	1062	2114	1669	3235	2821	7667
Number of fires	1115	792	2021	2072	924	2377	1303	1627	1938	2567	2702	5402	2789	6743
Average fire area, ha	0,6	0,4	0,8	1,4	0,5	0,6	0,4	0,5	0,5	0,8	0,6	0,6	1,0	1,1
Indicators	95	96	97	98	99	00	01	02	03	04	05	06	07	Average
Total area burned SFC, ha	2881	10982	579	3374	4508	1905	3860	5459	2956	621	2369	4287	12713	3098
Number of fires	3324	3991	1818	3509	5169	3696	3205	6383	4527	1876	4231	3842	5024	3147
Average fire area, ha	0,9	2,8	0,3	1,0	0,9	0,5	1,2	0,9	0,7	0,3	0,6	1,1	2,5	0,9

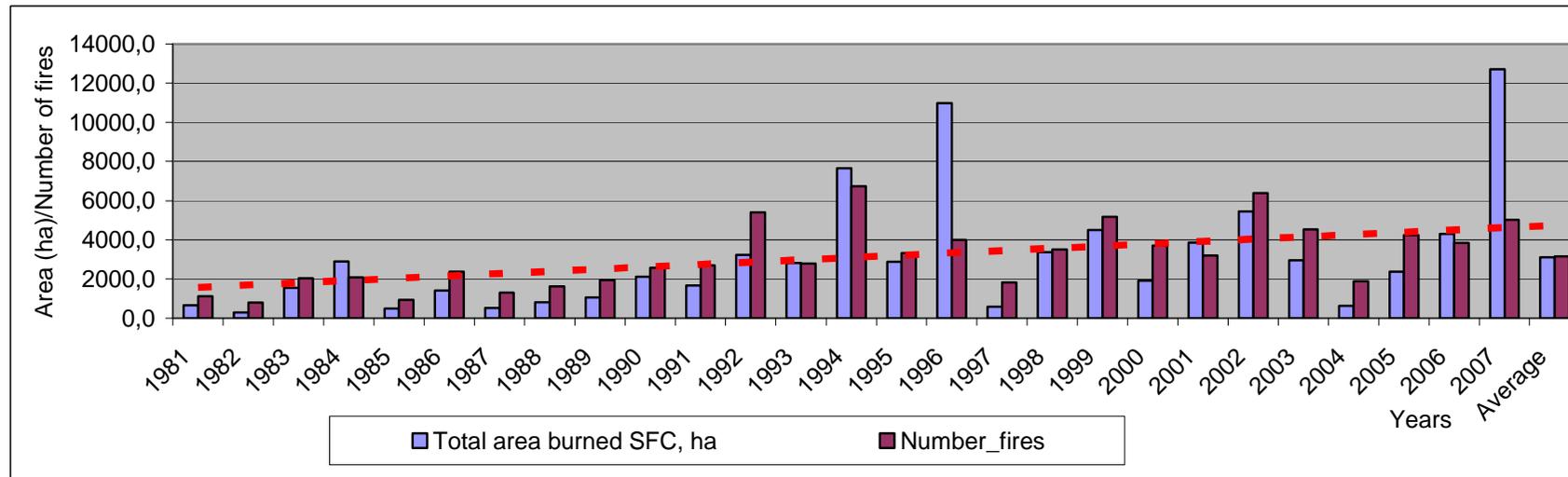


Figure 1. Total area burned (with trend) and number of fires in Ukraine during 1981 – 2007 years

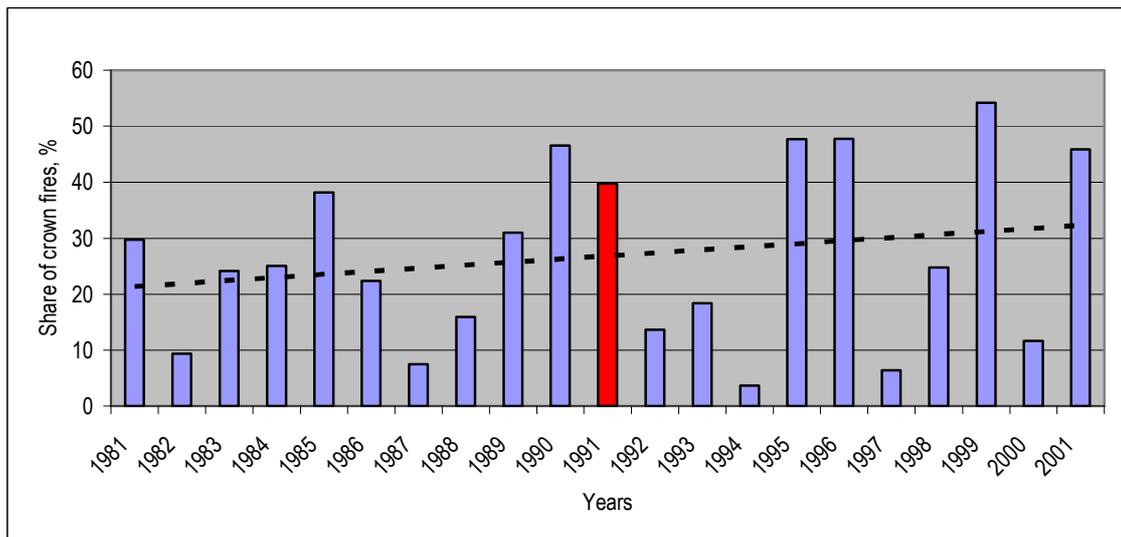


Figure 2. Share of crown fires from total, %

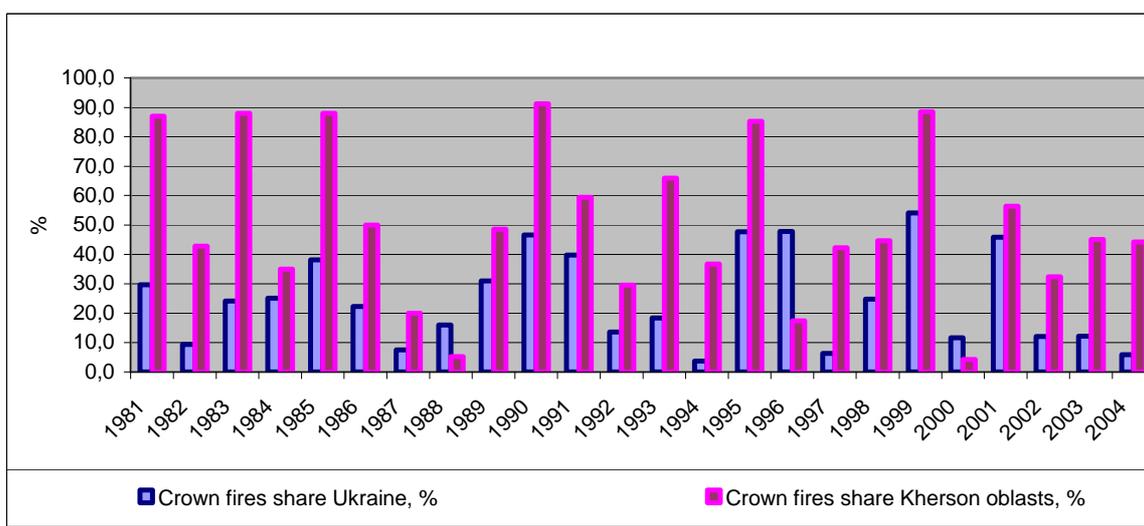


Figure 3. Compare of share of crown fires in Ukraine and Kherson oblast, %

Quality of forest management and, including fire management, essentially depend on ministerial subordination of forests. In Ukraine the majority of forests are in a state ownership (97 %), and those forests managed by about 50 constant users: committees, ministries and others, which are responsible for fire management organization as well. Overall control of forest management in forests of all constant users, its legal basis are carried out by the State Forestry Committee of Ukraine (SFCU) which simultaneously is also biggest constants user and operate of 68 % of Ukrainian forests. SFCU forests are considered as the best on quality and productivity and area of fires, as a rule, a little lower, than in forests of other constant users where there are less resources designated on fire management (figures 4, 5). Forest enterprises of SFCU have the better, in comparison with other users, fire-prevention equipment, are characterized by a higher level of the organization of fire control and better trained. In separate years, this peculiarity broke due to catastrophic fires, as it was in 2007,

when there were two fires in Kherson and Crimea with a total area up to 9 thousands hectares that is three times more than average long-term level.

Figure 4. Share of burned area by different constant users, % (100% - total burned area in Ukraine)

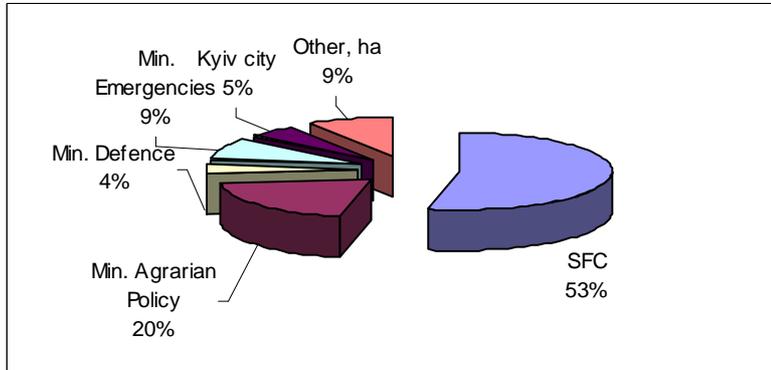
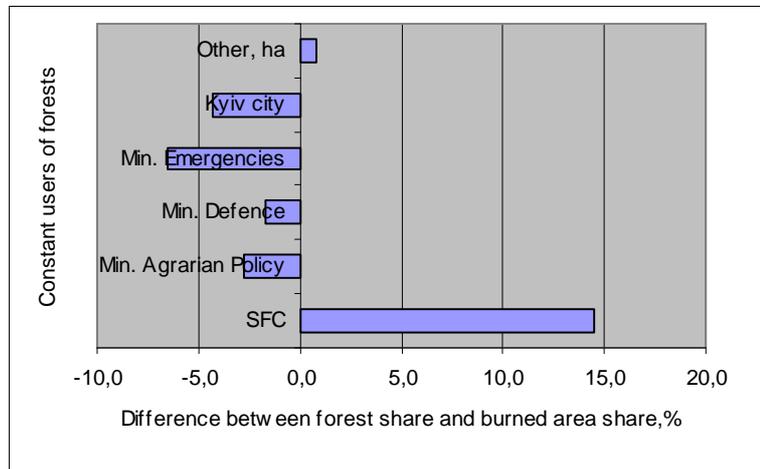


Figure 5. Differences between share of forests of constant user and share of burned areas in their forests, % (source SFCU - 2007)



If the area of fires depends, mainly, on detection and efficiency of fire forces response, number of fires displays specificity of using of forests by constant users (figure 6). Number of fires changes more or less synchronously in forests of all users except of Kiev city, the largest city of Ukraine, where presence of people at forests and, accordingly, ignition sources is highest.

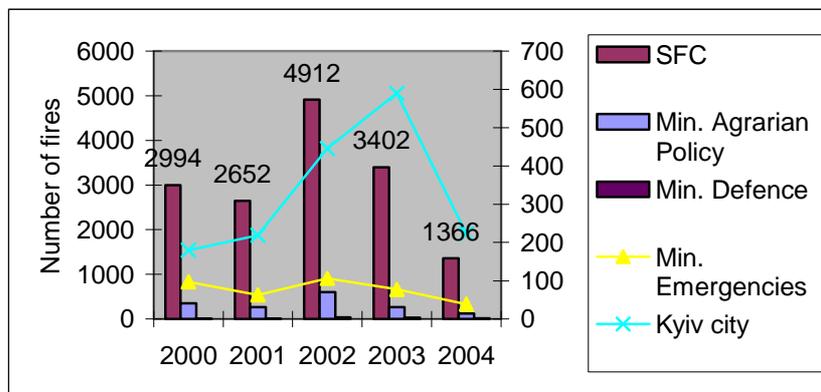


Figure 6. Long-term dynamic of number of fires in forests of different constant users

Highest intensity and area of fires happens in southern and southeast parts of the country which are characterized by a drought climate, periodic sandy storms in spring and summer and where evaporation exceeds precipitation. Low productivity of Scotch pine forests there, formation of gaps owing to dying off group of trees, a high degree of differentiation of trees inside of forest stand often create favorable structure for development of crown fires. Especially it is typical for such southern and southeast regions as Lugansk, Kherson, Kharkiv oblasts and Crimea (figure 7).

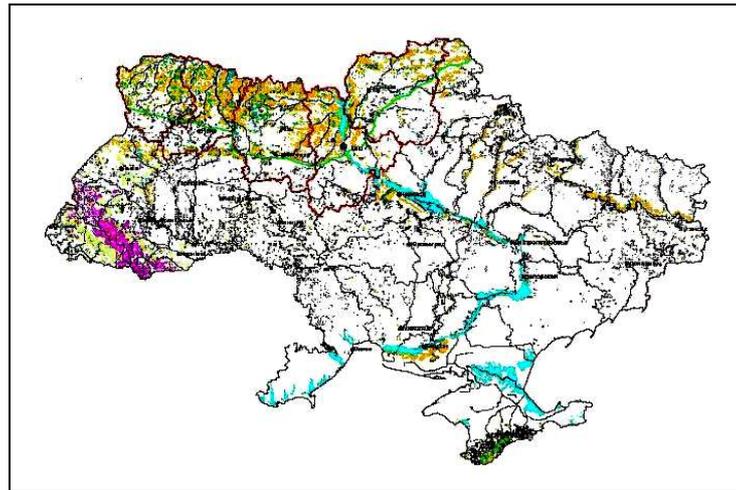


Figure 7. Most fire prone forests of Ukraine is a Scotch pine forests, which grows in the South along the biggest rivers, in Crimea peninsula and in the North

In 2007 69 % from the annual area of fires in Ukraine has occurred in the Steppe zone: in the Kherson area on the big sandy arena where after the Second World War significant areas of Scotch and Pallasiana pine plantations have been created, 9 % - in Crimea, from 3-up to 6 % in Lugansk, Donetsk and Dnipropetrovsk areas (fig. 8). Together in the Steppe zone and in Crimea there were most part of crown fires in 2007 - 99 % (fig. 9). Nevertheless, in other years, big crown fires happened also in the North. For example in Polissia - about 3000 hectares in the Volyn oblast in 2006 or near 17 000 hectares in Chornobyl exclusion zone in 1992.

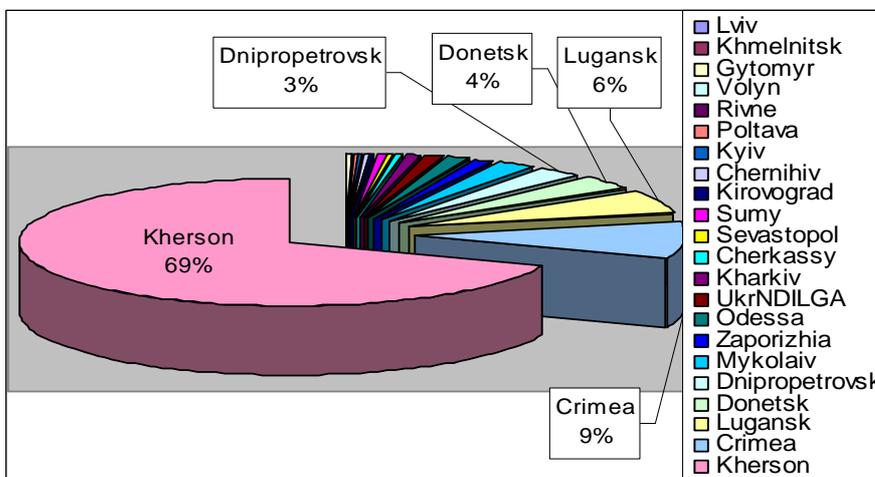


Figure 8. Share of areas of fires in different oblasts in 2007 (100% total Ukraine)

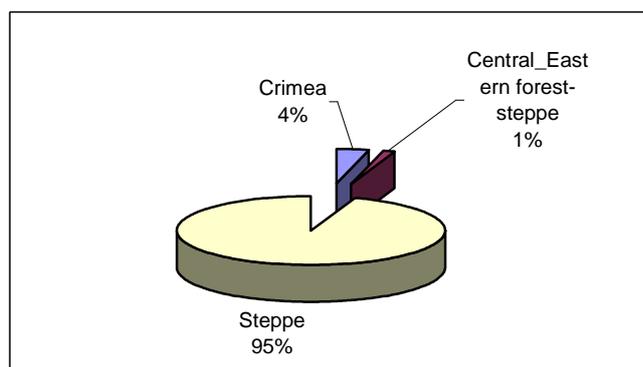


Figure 9. Share of crown fires in different natural zones of Ukraine in 2007 (all constant users)

More generalized statistical picture of forest fires in 2007 can be received within the borders of natural-climatic zones of Ukraine. Such association is correct for the analysis as the fire situation is mainly determined by climatic conditions. In 2007 highest number of fires happens in the South and South-East of Ukraine: in the Steppe (56 %) and in the Central-Eastern Forest-and-Steppe (25 %) that makes 81 % from total number of fires in Ukraine (tab. 2).

Table 2. Number and area of fires in different natural-climatic zones (2007)

Region	Number	Area, ha	Crown fires area, ha	Average area of fire, ha
Steppe	3186	11840	7183	3,7
Crimea	328	1600	303	4,9
Central-Eastern forest-steppe zone	1405	556	105	0,4
Forest zone (Polissia)	668	205	2	0,3
Carpathians	15	8	1	0,6
Western forest-steppe	58	7	0	0,1
Total /average	5660	14216	7594	1,7

Much smaller number of fires has occurred in the North - in Polissia zone (12 %) and in Crimea (6 %). In the Western regions, such as Carpathians and the western Forest-and -steppe zone, number of fires does not exceed 1 % from total that is determined by a frequent atmospheric precipitation and relatively high humidity of wood combustible materials. Number of fires is more dependent from quantity of population per hectare of the forest area, which considerably higher in regions with low forest percentage lands: in the South and a Southeast of Ukraine then with the general density of population in region.

The area of fires in 2007 is distributed among natural zones much more non-uniformly than their number (fig. 10).

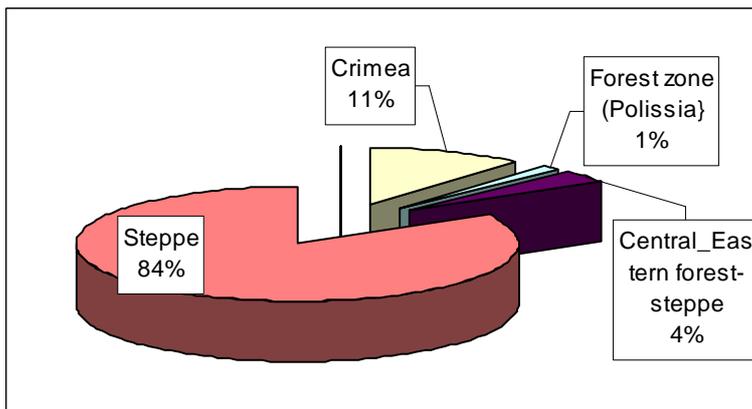


Figure 10. Distribution of area of fires in different natural-climatic zones of Ukraine (2007)

Due to two extreme fires in Crimea and Kherson, the total area of fires in these two regions reaches 95 % from a total area of fires in Ukraine, and average area of fire here also highest - 4,9 and

3,7 hectares accordingly in comparison with other regions (0,1-0,6 hectares).

1.2 Causes of wildfires, reasons or underlying causes of human-ignited fires

In 2007 in forests of SFCU have occurred 4,5 thousand cases of fires, from them of 98 % - due to casual ignition by population and burning out of dry vegetation. In long-term aspect certainly surpassing cause of forest fires in Ukraine is anthropogenic activity in forests - 96 % of fires arise from human ignitions (fig.11).

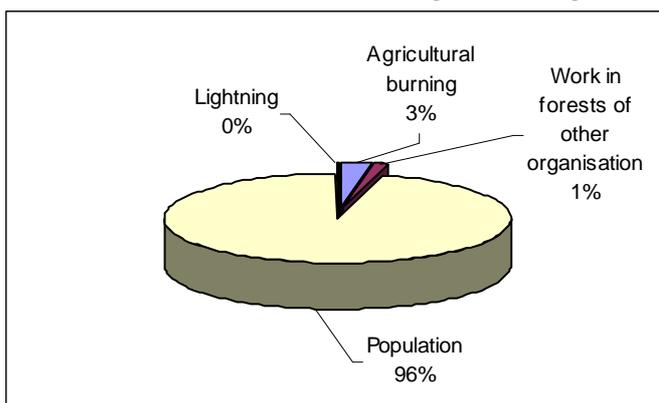


Figure 11. Typical cause of forest fires in Ukraine

Dry lightnings are sometimes mentioned among the cause of fires, nevertheless the share of such cause usually does not exceed 1%. A prevailing cause of fires (90-96 %) are human caused. It are stubs or not

flamed matches, not extinguished completely camp fires leaved by people who had a rest in a forest, sparks from vehicles, mainly tractors which move on forest roads. Additional prove of anthropogenic cause of fires are that the majority of forest fires arises on distance up to 100-200 meters from local, regional or national importance roads. The share of such fires in total constantly increases. A vivid example of negative consequences from human ignition is the catastrophic fire in Crimea in Alupka-city area in August, 2007. The fire were ignited by the lost his way tourist, who tried to attract attention of resqued helicopter by small camp fire. After resque team have noticed a place where the tourist were, he has dumped by his foot the rests of a camp fire from a rock downwards where droughty Crimean pine chapparel grows, that has led to a huge fire with a total area of 973 hectares, including crown fire on the area of 274,1 hectares, destructions of a unique forest and losses on millions hryvnas.

Agricultural burning is the second most widespread cause of fires. Big agricultural enterprises make controllable burning on agricultural fields after harvesting of grain and other agricultural crops or peasant's burn the vegetative rests on their small vegetables gardens. If fire prevention measures, such as fire breaks and barriers between borders of field and forest

do not stop fire distribution, fire extend inside forest, and, at favorable structure of wood combustible materials, can develop into big fire.

Villagers very often do not following with scientific recommendations concerning undesirability of burning of the vegetative rests on vegetable gardens in contaminated zones and use this traditional method of fertilizer of soils. Very often forest fires caused by villages that have remained in Chernobyl exclusion zone on constant residing. Small part of fires begins owing to maintenance works by other organizations in forests: at a lining of gas mains, power lines, other constructions in forests or at carrying out of preventive works on the specified objects.

Prevalence of the anthropogenic causes of fires prompts a highly effective way of fire number reduction by introduction of preventive actions system, in particular to fire-prevention propaganda among the population. Nevertheless, now not enough attention is given to this direction of fire management that demands its further development.

1.3 Description of extreme fires in 2007

In 2007 in Ukraine has occurred two extreme forest fires: in Kherson oblast (on August, 20-23rd) and on the South coast of Crimea peninsula (on August, 24-28th) which have caused a significant public resonance, attract big attention of mass-media and the Ukrainian government. Minister of Ukraine on emergencies were in charge personally for suppression of both fires. The President of Ukraine personally participated in Kherson fire suppression. Such resonance gives the certain hopes for greater attention of the Government to a problem of forest fires and on the certain strategic decisions, improvement of material base of fire fighters infrastructure.

1) The extreme forest fire in Golopristsansly forest enterprise of the Kherson oblast [2]. It was the largest forest fire in Ukraine for last ten years. For suppression of this extreme fire fire-prevention forces and means of forest enterprises, special forces of the Ministry of emergency, equipped by aviation means and other powerful technical equipment for fire suppression, and also army have been involved. The local authorities, unfortunately has no shown high involvement in terms of mobilization of reserve people and equipment from other enterprises of oblast. In total, in fire extinguishing took part over 900 workers of SFCU enterprises. Total area of forests burned by fire reached up to 7300 hectares, including a crown fire of 6200 hectares. Accordingly to a tentative estimation, the general damage has reached 79 million UA hryvnas (15,8 million dollars), including 560 thousand dollars only directly loss.

2) The extreme forest fire on southern macro slope of Crimean Mountains in area of settlement Alupka (accordingly to conclusions of working group of Republican Committee of Forestry and Game management of Autonomous republic Crimea (RCFGM)). Total area which has been burned by the fire has reached about 900 hectares, including crown fire - 250 hectares. Up to 400 fire fighters of the RCFGM took part in fire suppression. 19 fire tracks from forest enterprises, 479 fire fighters and 50 fire tracks of the Ministry of Emergency of Ukraine, 89 fire fighters and 12 fire tracks of other departments, and also 3 helicopters and 1 airplane of the Ministry of Emergency of Ukraine. Fire was caused occasionally by tourist who has ignited a camp fire at top of a rock that he can be seen by resque service. Mobilization of forces for fire put out was carried out accordingly to operating plan of mobilization of Jalta Mountain Forest Natural Reserve (JMFR) and the Instruction of interaction with forces of the Ministry of Emergency of Ukraine in Autonomous Republic Crimea in case of suppression of big forest fires. Fire has occurred in an inaccessible place in

mountains, distribution of fire happened spontaneously in conditions of a strong gusty wind with speed up to 20 meters per second and an air temperature over 30 degrees. The fire has developed in crown fire storm, and sparks scattered in a direction of a wind in different places where new centers of fire arised. In such conditions it was not possible to localize a fire in an initial stage. Information about fire suppression were transferred to RCFGM from a place of suppression and further to the dispatcher of the Ukrainian State Base of Fire Aviation protection of forests. The fire has been put out after 5 days.

1.4 Fire Damages in 2007 (social, economic and environmental)

In 2007 forest fires have not led to direct negative social loss, in particular, losses of houses or infrastructure. It is because of fact that the forest lands are the lands of exclusively for forestry and are not used for building construction or other purposes. The ratio of economic and ecological losses owing to fires is predetermined by natural zone where they happened. In the North of the country and in the Central regions (Carpathians, Polissia, Forest-and-steppe) where share of forest lands relative high (10-25%) and where there were no big fires the main losses consist in costs of lost wood production and in ecosystem damage. The damage from extreme fires in the South of the country is very significant, because the burned forests has been by presented unique, outside of natural habitat zone, vegetation. These forest ecosystems were formed during decades and, probably, decades will be necessary for their restoration. Directly after big fires in Tsurupinsk and Goloprstan rayon's of the Kherson oblast in August, 2007, the Government of Ukraine made the decision according to which were allocated to SFCU 14,3 million hryvnas (2.9 million dollars) from reserve fund of the state budget for carrying out of urgent actions on liquidation of consequences of forest fires and restoration of the burned forests (fig.12.).



Figure 12. Burned Scotch Pine forest in Kherson after extreme crown fire in August 2007. Dying of forest renew risk of sandy storm typical for the region 50-100 years ago (picture courtesy of Ministry of Emergency of Ukraine)

1.5 Fire prevention measures in 2007

Fire-prevention measures are important part of fire management system in Ukraine. The responsibility for planning, volumes and quality of pro-active actions lies down on

constant users of forests. All preventive actions includes precautionary and limiting ones. Usually, in the beginning of a fire season (on April, 1st) the SFCU and each forest enterprise prepare the letter concerning actions on preparation to fire season. At local and regional levels actions on restriction of the access in forests in case of approach of high fire danger and mobilization plans for a case of big fires between foresters and local government are coordinated. In 2007 preventive measures has begun with carrying out or renewal fire breaks in places with the greatest fire risk, prepare of equipment for suppression, communication devices and training of the fire fighters. In 2006 397 km of fire breaks have been created, on what has been spent 743 thousand hryvnas (149 000 USD), 457 km fire barriers (716 thousand hryvnas), were provided care of fire breaks on 233 140 km (1 993 thousand hryvnas). In recreational zones places for camp fires, smoking and rest of people have been prepared.

With approach of high fire danger weather the big attention is given to fire prevention propaganda, to performances on radio and TV, to publications in a press. Nevertheless it is necessary to note, that efficiency of such actions, especially in densely populated areas is low, that demands their improvement. The local population usually does not realize all ecological value of a forests and very often cause fires, especially during traditional holidays when many people moves into a forests on rest in the spring and in the summer. It is necessary to improve educational work at the national level - in national newspapers, radio and TV. Totally, in 2007 1 million 360 thousand hryvnas have been spent by only SFCU on fire management measures (fire breaks, suppression of forest fires, purchase of fire vehicles).

Proper forest management in forests of Ukraine, regular cleaning of forests from deadwood and fuel according to requirements of the Ukrainian forestry legislation allows to keep forests in a satisfactory sanitary and fire-prevention condition. The high density of forest roads and high population density helps with early detection of fires, fast delivery of fire forces and fast localization of fires in most part of cases. That is why, Ukraine has low average area of fire. Unfortunately, the system of preventive measures which quite effective in common climatic conditions does not work well at approach of such critical conditions as a long drought and a strong wind.

1.6 Response to fires in 2007 : Fire suppression

1.6.1 Kherson oblast big fire suppression.

Day 1. Forest fire in Golopristsanskiy forest hunting enterprise (GFHE) were detected by foresters on August, 20th 2007 at 11:30 on the area of 0,03 hectares in quarters 67, 68. At once 30 firemen, 10 fine-engine vehicles and 3 tractors have been directed to fire. Due to strong impulses of a wind and heat air in the area the fire extended in all directions. Fine burning branches and cones were scattered by a wind on distance 150-300 meters. In process of development of a fire for its suppression additional forces of SFCU and the Ministry of Emergency were requested. At 15:35 24 fire tracks, 8 tractors and 90 persons were mobilized on the fire. From SFCU - 65 firemen, 19 fire tracks, 8 tractors, from the Ministry of Emergency - 25 firemen, 5 fire tracks (fig. 13).



Figure 13. Two firefighters from forest enterprise laying fireline, Kherson oblast, August 2007 (picture from the official web-site of the President of Ukraine)

The area of a fire soon has reached *1000 hectares*. The supervising of suppression was taken up by Vice-president SFCU. At 22:00 on August, 20th SFCU through Kiev company "Aviant" the sanction has been received and the letter of guarantee on payment for services of plane AN-32 is given. As the Kherson airport practically did not work, the plane could arrive on a fire only in the morning on August, 21st. Simultaneously at 16:40 20.08.07 suppression of fire which has arisen in Tsurupinsk - located nearby hunting enterprise was carried out. Minister of Emergency of Ukraine and Mr. President of Ukraine were arrived on fire place (fig.14).



Figure 14. Minister of Emergency of Ukraine report to the President of Ukraine the Kherson fire operation details, Kherson, 21 of August 2007 (picture from the official web-site of the Ministry of Emergency of Ukraine)

Day 2, August, 21st, 2007 at 6 o'clock on fire extinguishing has arrived Head of SFCU under which personal assignment from reserve of SFCU for fire extinguishing in addition allocated 10 thousand litres of gasoline and 3 thousand litres of diesel fuel (fig.15).



Figure 15. Headquarter of Kherson fire suppression, Kherson oblast, August 2007 (picture from the official web-site of the Ministry of Emergency of Ukraine)

Also have been solved problem of additional financing of the Kherson oblast forestry administration in the sum 680 thousand hryvnas (136 thousands dollars). After redistribution of resources from Northern and Carpathian regions of the country, financing of expenses for meal of the firefighters involved in fire suppression, in the sum 100 thousand hryvnas (20 thousands dollars) were provided (fig.16).



Figure 16. Food supply organisation of fire forces during Kherson fire operation, Kherson 23.08.07 (picture from the official web-site of the Ministry of Emergency of Ukraine)

Day 3-4. Head of SFCU directed to a place of a fire from jurisdictional forest enterprises of Republican committee of Autonomous republic Crimea and other oblast

administrations (Dnipropetrovsk, Mykolaiv, Odessa, Kharkiv, Zaporozhye, Zhitomir, Rivne, Cherkassy, Chernigov, Sumy, Kiev, Poltava) 13 special fire brigades of an aggregate number of 383 persons equipped for fire suppression and communication, field equipment for spending nights, food, and also 15 fire-engine vehicles. Besides on a fire it was involved 210 people of foresters from the Kherson area. In general on fire extinguishing in Goloprstan and neighbor Tsurupinsk hunting enterprises 118 fire-engine vehicles, including 42 - SFCU, 22 forest tractors, other technical equipment of 40 units, including 10 - SFCU are involved.

Day 5. Since August, 24th stage-by-stage replacement of staff of operative groups is organized as operating conditions were extremely complex. 24.08.07 about 16 hours at a strong wind in several places at once several crown fire started. Additionally 28 fire fighters with Vinnitsa and 25 - from Khmelnytskyi regional forest administration have been in addition allocated to fire suppression.

1.6.2 Jalta natural mountain forest reserve fire suppression

The Crimean extreme fire which has occurred 24 August, 2007 can be a typical example of response and interagency interaction of fire forces in case of big fire. Below the description of stages of suppression of this fire is given in the Report of Governmental commission [1].

Day 1. At 19 o'clock 40 minutes on August, 24th, 2007 person on duty in Jalta forest mountain reserve (JFMR) the information received that on rocks in quarters N11 of Alupka forest area are visible four fires. The person on duty has transferred the information to director of the reserve and to the department of Jalta Ministry of Emergency. At 20:20 director of the reserve has informed that fire is developing in unavailable mountain area. The information has been transferred to the Republican committee of forestry and game management of Autonomous republic Crimea (RCFGM). As a response, the fire-engine vehicle and 3 firemen from Alupka forest range has immediately been directed there. 21:50 – fireman tried to lay fire lines to the fire and asks the help. Wind did not abate, fire extended. Addition fire fighters and tracks were directed to the fire. 22:00 two more tracks and 14 foresters from JFMR joint others on suppression of a fire. The area of a fire reached about 0,3 hectares. Director of JFMR took supervising of fire suppression. 22:20 to a place of a fire first Vice-Head of RCFGM has arrived. 23:55 to the fire in addition has arrived 22 fire fighters from the Jalta department of the Emergency. Speed of a wind in impulses reached 20 meters per second, fire extends in inaccessible places (Fig. 17).

Day 2. 25 August 07 06:30. Headquarter for fire suppression was created with supervising of arrived earlier Chief of the Ministry of Emergency of Ukraine in AR Crimea, Head and First Vice-head of RCFGM, director JFMR. Forces which were arriving were allocated onto the certain points on perimeter of a fire. 07:00 wind did not stop, fire moved aside toward Yalta city and additional help from the Ministry of Emergency were requested. 07:05 observer from a post has confirmed, that the fire continue to extends. On a fire there were arrived new forces which under the order of a chief directed toward certain sites of the fire. Supply of fire fighters with water, food and engines with fuel is continuing. 12:15 for an estimation of fire spreading, helicopter MI-2 makes flight around the territory - area of the fire exceeds 5 hectares, also observed cases of transition of a ground fire in crown fire (Fig. 18).



Figure 17. Fireman from forest enterprise provides fire break in mountain condition during big fire in Crimea, August, 2007 ((piture courtezy of Maxim Svolynsliy)



Figure 18. Big fire near Jalta, Crimea, August 2007 (piture courtezy of Maxim Svolynsliy)

Ground forces and means take all measures for deduction of front of fire. 20:00 fire continues to extend, it is impossible to keep fire inside of existing perimeter, it is difficult to determine area because of strong smoke. The wind constantly changes direction and amplifies. With approach of darkness were raised couple centers of crown fires and fire fighters were dislocate from this dangerous direction.

Day 3. August, 26th. 03:20 situation in the fire center has become complicated because of a gale-force wind and became uncontrollable that demanded to send additional forces from forest enterprises from other oblasts. Supervising of fire suppression was taken by Vice-president of Council Ministries of Autonomous republic Crimea. During the day Head of the Supreme Council of Crimea, Chairman of Council of Ministries of Crimea and Minister of the Ministry of Emergency of Ukraine arrived and took part into supervising of fire suppression. Works on fire putting out are constantly conducted, change of staff and food, water and fuel supply were going on. Till the evening the basic front of distribution of fire were stopped, but separate centers of fire have been increasing inside the perimeter of fire. In connection with change of wind direction threat of distribution of fire towards Alupka and tourist cable road was arisen.

Day 4. August, 27th. In connection with distribution of a fire aside cable road and because of inaccessibility of that direction for ground fire forces aircraft of the Ministry of Emergency of Ukraine called for fire suppression (Fig.19).



Figure 19. Air force operation during Crimean fire suppression, Crimea, Alupka, August 2007

The detailed information on the big forest fire is directed to Office of Public Prosecutor of Autonomous republic Crimea.

Day 5. August, 28th 10:30 - distribution of fire is stopped on external perimeter of a fire and local fires inside were stopped. Suppression is finalized.

2. National cooperation in responding to the 2007 fires (inter-agency, involvement of civil society)

Experience of extreme fires of 2007 has shown that the main problem of fire suppression is insufficiently effective interaction of forestry enterprises fire forces, which are responsible for forest fire management, with regional and national forces of the Ministry of Emergencies of Ukraine and military divisions. Experience showed that forces and means of

fire suppression of forest enterprises not in a position effectively suppress fires during critical weather conditions and big areas of fires. In case of approach of such weather conditions which took place in 2007, only joint fast response of fire forces of forest enterprises and the Ministry of Emergency, and in some cases army divisions will allow to stop development of fires at early stages and will not allow its development in an extreme situation.

In case of the Kherson fire, the main problem became rather later reaction of divisions of the Ministry of Emergency which is usually better equipped and prepared for fighting extreme fires. Regional forces of the Ministry of emergencies waited that the fire will be localized by forces of state forestry enterprises. Limitation of resources for forest fires suppression, and first of all, lack of fuel for wide scale and fast response of ground forces and air forces operation has caused that greater forces have been jointed only when the fire became practically uncontrollable. Finally, only application of aircraft has allowed changing a situation to better, nevertheless the general expenses have considerably exceeded, those were necessary for early and joint response. Other reason of failure of fast fire suppression was insufficient involvement of local authorities. The local authorities did not effectively assisted with attraction of additional necessary human and material resources from regional sources. Local communities because of low level of living, especially in countryside, had no opportunity actively assist with suppression.

Positive role played mass-media. Wide informational coverage of a fire suppression by mass-media, participation of the first persons of Ministries and of the President have played a positive role in mobilization of reserve resources of the government for successful suppression and maintenance with all necessary of firemen. President visited the place of fire in November 2007 to participate in restoration of burned forests (fig.20).



Figure 20. Mr. President of Ukraine Victor Yushenko participate in resstoration of burned forest, Autumn 2007, Kherson oblast

In the same time, big fires happened in 2007 became a reason for wide criticism by mass media and NGO of forest enterprises fire forces because insufficient efforts. Nevertheless, in most cases, low efficiency of reaction of forest enterprises fire forces is

related not with organizational reasons, but with unsatisfactory material supply, absence of reserves, a moral and physical deterioration of fire fighting means. So interaction of divisions of the different organizations and departments during suppression of fires demands certain improvement.

3. International cooperation

The international meeting on “Reducing Risk of Disaster from Catastrophic Wildfires in the Chernobyl Irradiated Forests” was held in the National Agricultural University, Kiev, Ukraine, 26-27 July 2007 (http://www.fire.uni-freiburg.de/intro/about4_2007.html#July). The meeting was organized by Yale University School of Forestry and Environmental Studies Global Institute of Sustainable Forestry and by the National Agricultural University of Ukraine. The meeting was sponsored by the Chopivsky Family Foundation and held under the auspices of the United Nations International Strategy for Disaster Reduction (UNISDR), Global Fire Monitoring Center (GFMC), and the Government of Ukraine, with participation of the Council of Europe (CoE), the Organization for Security and Cooperation in Europe (OSCE), the World Conservation Union (IUCN), the Ministry of Ukraine of Emergencies and Chernobyl Affairs, and the State Forestry Committee of Ukraine. The meeting brought together more than 80 participants from Belgium, Belarus, France, Germany, Spain, Switzerland, Russia, Ukraine, and USA, representing government and international organizations [3.4].

Participants at the meeting were presented with a comprehensive picture of the current wildfire risk situation in the forest still contaminated by radioactive fallout from the 1986 Chernobyl nuclear disaster. Concerns include fire risk assessment ability, potential effectiveness of the currently existing forest fire suppression system, potential of proactive forest thinning to reduce fuel hazard, fire detection ability, and the amount of technical and human resources allocated to fire management. The ecological, social, and economic consequences of potential catastrophic radioactive wildfires were discussed. The critical components of the problem were specified and fire risk forecasts were demonstrated.

A strategic plan for disaster risk reduction with preliminary cost estimates was presented, entitled “First Draft of Proposed Implementation Plan and Budget for Reducing the Risk to Kiev and other Areas of Forest Fires with Radioactive Smoke from Forests impacted by the 1986 Chernobyl Nuclear Disaster.” It is being revised and edited.

It was also mission of US Forest Service organized into the Chernobyl exclusion zone during 20-20 of May for fuel assessment in the forests of the exclusion zone (led by Richard Lasko).

3.1 Providing assistance

The Ukrainian fire services gave the help in suppression of the big forest fire in Georgia where, in particular, there was a directed helicopter with the water-drain device during the big fire in natural forest reserve near Tbilisi. It was after personal call of Georgian President to the President of Ukraine.

3.2 Receiving assistance

The international cooperation in the area of fire management in Ukraine is not developed, therefore any inquiries for assistance to other countries was not given also the help has not been received.

4. Analysis and recommendations

Response of forest fire forces in 2007 on fires in the North and the Central regions of Ukraine (Forest zone and Forest-steppes) can be evaluated as satisfactory, that can be proved by low area of average fire. Response of fire services of different agencies, their interaction,

efficiency and time of suppression were not effective in that regions where critical climatic conditions happens (the South and South-East of the country) in the form of droughts and wind and also in regions, where forests are very fire prone. This caused occurrence of big fires, has led to lost of significant costs for suppression of these fires and substantial damages. Complexity of a fire season of 2007 in Ukraine, which was one of the most adverse for last years, demands to draw conclusions with the purpose of minimization of probability of recurrence of extreme fires in the future. Working groups after analysis of noted extreme forest fires had been formulated following conclusions and recommendations:

1. To investigate in details and to analyze the cause of forest fires and strengthen legislatively the responsibility for actions which caused fires.
2. To complete technical provision of forest fire stations with modern fire fighting tools and machines accordingly to Regulations about Forest Fire Station
3. To increase efficiency of response to fires by reduction of time from receiving of the information on fire prior to the beginning of suppression. To provide inventory of fire roads, to develop plans on reconstruction of existing fire roads and creation new ones. To increase number of fire pounds in a forests according to normative requirements with the purpose sustainable supply with water of participants of suppression.
4. To prepare the request to the SFC of Ukraine about additional financing from the State budget of Ukraine for increase flight time of aviation patrolling of most fire dangerous territories, and also air patrol during fire dangerous season helicopter MI-8 with the water-drain device. To install on territory addition two retransmitters for increase of coverage of an operating radio communication.

In addition to recommendations which have been given above by working groups, it is necessary to consider following recommendations developed by Ukrainian forest fire Focal Point:

- 1) In connection with increase in frequency and intensity of extreme fires, efforts on improvement of national fire policy in the field of forecasting, prevention are necessary for reducing of extreme situations in a forestry and, first of all, extreme forest fires. Fire policy should include both strategy at the national level and mechanisms of interagency and international interaction in case of extreme fires;
- 2) To make inventory of fire prone forests of Ukraine with the purpose of allocation of potential critical territories from the fire point of view on which priority attention of fire services should be concentrated at approach of critical weather conditions. To provide finance opportunity of aviation patrol and fast suppression right after receiving messages on occurrence of a fire when high risk of its development to extreme level is exist.
- 3) For these territories with high fire risk to develop the advanced system of fire-prevention measures coordinated with local authorities, and also to create system of support of decision-making during suppression of fires on the basis of GIS, satellite pictures with using of models of fire behavior and forecasting.
- 4) To develop corresponding strategy of their suppression based on estimation of necessary forces and means;
- 5) To strengthen material support of fire management, including, new fire cross-country tracks, water pumps and backpack pumps, and reserves of fuel for emergency cases;
- 6) To improve the order of inter agency action and communication during fire operation to provide forces with a communication equipment they need;

- 7) To organize additional trainings with participation of international observers and neighboring countries on suppression of extreme fires with attraction of inter agency forces and to improve on this basis mobilization plans.

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