The analysis of original causes of reed fires in Zhalong wetland nature reserve in Heilongjiang Province [1]

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Abstract

In recent years, the serious reed fires occur in Zhalong nature reserve in Heilongjiang Province. From 19th to 28th of March 2005, 12 fires occurred in Zhalong nature reserve, the fire has involved Qiqihaer, Duerbebe, Lindian and Daqing, the burned area is about 18666 hectares. Zhalong nature reserve has its fire environment taking meteorological factor as leading factor that is pregnant with for a long time, it makes the reed, meadow withered and yellow that it is arid and short of rain for a long time, withered fallen leaves and water contents of humus are reduced greatly, fuel accumulation increased and dry, form the fire environment. It mainly follows the spreading of underground fire with the powerful surface fire, it is extremely easy to burn and spread very quick, once the fire takes place, spread rapidly, can form the scene of a fire of area largely, spread for long time sometimes. The wetland traffic is inconvenient; it is very difficult to put out a fire. People's understanding of the wetland and fire are scarce and incorrect, make wetland and fire unable to find in time, put out a fire to save life and property early. The wetland and fire are constant in recent years in our country; need to cause the attention of each side.

Zhalong nature reserve locates in Heilongjiang Province, the border area of Qiqihaer city, Fuyu County, Lindian County, and Tailai County. The area of the nature reserve is 210,000 hectares, is our country first nature reserve for the wetland and the crane class protection. When most, here red-crowned crane population quantity achieves 300. Zhalong nature reserve is situated at Songnen Plain, the Wuyuer River downriver, is our country biggest nature reserve that taking the crane class and the wetland ecology as the protecting body. In the world there are only 15 kinds of cranes class, 9 kinds live within China, but there are 6 kinds live in Zhalong wetland, they are all near extinct species. There are 1000 red-crowned cranes in the world, and there are about 300 cranes in Zhalong wetland, moreover also there are other 35 kinds of key protection birds to perch here.

Reed meadow in the wetland has the function of self-control water source, the purification water quality, increment wetland peat and vegetation, adjustment climate and so on. The wetland ecology function value is more than the value of reed, grass, and fish that the wetland produces. In 2005, the occurrence of forest fires in Heilongjiang Province has its long-term breeding environment that taking the meteorological factor as the leading fire conditions. The long-term drought cause the weed withered and yellow, the water content of the litter and peat reduce greatly, fuel accumulating and dry, forming the fire environment (Wang, et al., 2003a; Wang, et al., 2003a). The human lacks of the correct understanding to the wetland fire, cannot

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achieve the prompt detection to the wetland fire, and fight early, must bring to all quarters attention (Frandsen, 1987; Wen et al. 1999).

1 Forest fires situation in Heilongjiang Province

From March 19 to 28, 2005, the fire broke out along with the wind and burnt to Qiqihaer city, Duerberte Mongolian national minority Autonomous County, and Lindian County, large area wetland became coal place within several days.

On March 19, the reed agriculture farmers sheared the reed and used the fire carelessly, caused the fire. Hasten by the gale, formed several scenes of fires, spread to all around rapidly. The highest speed of fire is 20km per hour, the fire intensity is extremely strong, the fire head could be 3~4m high. On March 21, the fire burned into the part of Nature Reserve belongs to Qiqihaer city. Because the fire occurred in wetland, the litter is very thick, and the terrain is complex, this brought much difficulty fire fighting. After the flaming fires were fight out, the smoldering fires is difficult to eliminate completely. Under the condition of wind, reignited, and initiated many fires(Kaufmann, et al., 1990).

On March 28, after fought fires with all one's strength, and under the condition of rain and snow weather, the fires in Zhalong Nature Reserve were suppressed. There were 12 fires in the Nature Reserve during burning, and 10000 people participated in the fire fighting work, the fire have affected the Qiqihaer city, the DuerBerte Mongolian national minority Autonomous County, Lindian County and Daqing. Because the wetland terrain is very complex, the fire engine is very difficult to access the burning area. The reed fire spread very quickly, the wind power fire extinguisher played the role with difficulty, most of the fire fighters used the broom, the wicker to swat, caused the fire fighting progress to be difficult(Cahoon, et al., 1994).

According to the analysis of the satellite image, the burnt area of Dumeng County, Lindian County and Qiqihaer city was 10,000 ha, caused the significant economic loss.

2 Forest fires environment in Zhalong Heilongjiang Province

From 1999, for long time drought in the entire Zhalong Nature Reserve, the litter and the grass were extremely rich. Because continuously arid, the fuel was extremely dry, and the reed agriculture farmers carelessly used the fire, the fires became out of control, the reed fires spread very quickly under the conditions of big wind.

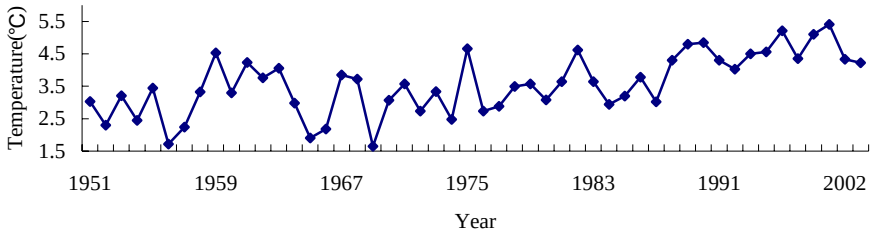

Figure 1— Annual average temperature (1951-2004)

2.1 Fuel

Most of the fuel is reed and grass in the Zhalong Nature Reserve where the fires occurred. With the tendency along with the climate warm, the load of reed and the grass accumulates year by year, the load of litter and peat increased significantly, and the fire danger increased accordingly. Because the continual drought and high temperature, the surface fuel is extremely dry. The rate of decompose of reed grass, reed root, branches and leaves reduced, the fuel load accumulated significantly, the thickness of the dry reed reached 0.6~0.7m, and the fuel loading reached 12~15kg/m^2. Because the accumulation of leaves, root and litter is very heavy in the Nature Reserve, it has the high possibility to occur large area fires in this region in the future.

2.2 Weather

In a special area, the vegetation, the terrain and the fire source is stable, but the fire weather condition changes anytime and anywhere. The change of weather condition affects the fuel moisture content and burning efficiency. Under the impact of global change, specially the El Niño, and La Niña events, the drought, the gale, the unusual weather increases. Since 1999 Heilongjiang Province has got the continuously drought, the reed moisture content only is 40~50% of the reed in the normal year.

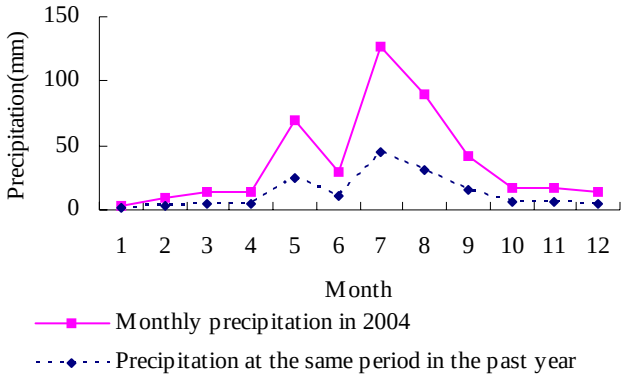

Figure 2— Precipitation in 2004 compared with history in the same term in Heilongjiang Province

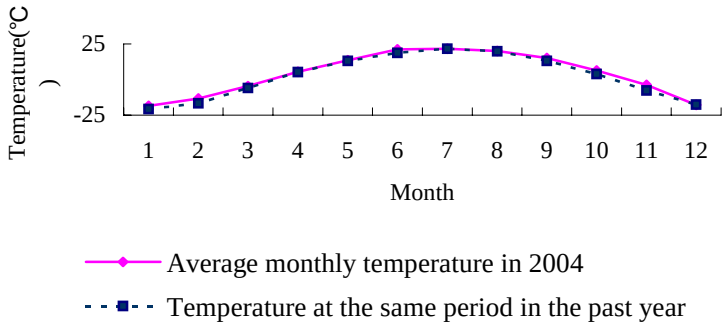

Figure 3— Temperature in 2004 compared with history in the same term in Heilongjiang Province

Since 2004 summer, The average temperature of Heilongjiang Province continued high, the average temperature is higher 0.5~1℃ and the precipitation is less 30% to

70% than the same period of all previous years, especially in Qiqihaer, the drought is extremely significant. The surface fuel dehydrated very seriously, it is very easy to be ignited.

2.3 Hydrology

Zhalong wetland is originally upstream the rivers diffusion formed, upstream river is often waterless in recent years, the upside rivers also had the hydraulic engineering project to intercept the river, and the local farmer pump the wetland water to irrigate land massively, caused wetland to be in continuously lacking of the water. Although the wetland was supplied water after the fires in 2002, because the wetland lacks of water supplying system, the drought of the wetland caused serious effects. The different area fires occurred in the Zhalong wetland from 2001. Lacking of water is the basic reason for the fire occurrence in Zhalong wetland.

2.4 Fire sources

Since the spring of 2005, for the high air temperature and little precipitation, the fire danger rating is very high. The reed agriculture farmers sheared the reed and used the fire carelessly, caused the fire. Hasten by the gale, formed several scenes of fires, spread to all around rapidly. The highest speed of fire is 20km per hour, the fire intensity is extremely strong, the fire head could be 3~4m high.

3 The effect and flammability of reed meadow

3.1 Flammability of reed meadow

In the shoal and the bog of the wetland, reed and grass grows everywhere, the reed is the high pole crop, the stem is empty, the fiber is long, and the dry reed is extremely inflammable. Moreover the calorific value of reed pole and grass pole is high, once ignited, spread extremely rapid, can form big area fire, and sometimes can burn very long time. Most transportation to reeds meadow wetland is inconvenient, this make it to be very difficult to fight the fires.

Most of the fires in the Zhalong wetland are high intensity surface fires followed by ground fires, and spread very quickly. The reed meadow fire mainly occurs in the time of reed sprouts, withered and yellow, and harvest season. Fire season has close correlation with weather condition, are humidity, and wind.

Figure 4— The withered and yellow reed is extremely easy to burn in Spring

Figure 5— The grassy reed burned black after fires

3.2 The effect of reed fires

The fire destroyed the reed sources. The wetland could recover burned by low intensity fire in the same year, the wetland could recover after two or three year if burned by moderate intensity fires, but if burned by some high intensity fires, especially ground fires, the reed root was burned dead, this area will become grass land or wasteland, it is very difficult to recover to original condition in short time. This area cannot provide red-crowned crane and other aquatic bird enough grass to build the nest.

Not only the fire polluted the air, and also affects the function of wetland to just climate and flood control. After the fire, fish and shrimp sources reduce suddenly, and the habitat of wild birds and the crane class is worse.

4 Conclusion and discussion

On March 19, 2005, the reed agriculture farmers sheared the reed and used the fire carelessly, caused the fire. On March 28, after fought fires with all one's strength, and under the condition of rain and snow weather, the fires in Zhalong Nature Reserve were suppressed. There were 12 fires in the Nature Reserve during burning, and 10000 people participated in the fire fighting work, the fire have affected the Qiqihaer city, the DuerBerte Mongolian national minority Autonomous County, Lindian County and Daqing. The burnt area of Dumeng County, Lindian County and Qiqihaer city was 10,000 ha, caused the significant economic loss.

Because the long time drought in the Zhalong reserve in 2005, the water content of fuel is very low, fuel accumulated significantly, form the burning conditions of the fires.

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