ON ESTIMATING METHODS OF ECONOMIC LOSSES OF FOREST FIRE

Kong Fanwen
(Research Institute of Forestry Economics, Chinese Academy of forestry Sciences, Andingmenwai, Beijing, 100029)
Gao Lan
(Beijing Forestry University, Xiaozhang, Haidian District, Beijing, 100083)

ABSTRACT

This article has discussed comprehensively about the concept, classification, estimating methods and grading standards of economic losses of forest fire. The contents of economic losses of forest fire includes the losses of forest resources, direct economic losses, indirect economic losses and the economic losses on ecological environment. Different estimating methods are adopted for each of them. And, according to the amount of economic losses, forest fires are divided into extraordinarily serious forest fire, serious forest fire and ordinary forest fire.

KEY WORDS

economic loss of forest resources, classification, estimating methods, fire grading

1. CONCEPT OF ECONOMIC LOSSES OF FOREST FIRE

Economic losses of forest fire refer to the economic losses which reach certain amounts caused by forest fire to the young stands of which the preserving rate is over 40% or natural stands of which the closing rate is over 0.3. And forest fire is graded by the economic loss it causes.

2. THE CONTENT AND METHODS OF THE ESTIMATION OF ECONOMIC LOSS OF FOREST FIRE

The estimation of economic loss of forest fire has adopted a method of

estimating by classes. That is, based on the estimation of economic loss of each class, get the total amount of loss caused by each forest fire.

(1) Loss of standing timber resources refers to the value of real burnt stock volume within the forested land area caused by each forest fire, estimated by different tree species. The estimating formula is

$$L = \sum_{i=1}^{n} ViTi$$

among which,
L--the amount of economic loss of standing timber resources;
V--the loss of stock volume; T--forest price of standing timber;
i--different tree species, i=1,2,3...n.

A. The formula for estimating the loss of stock volume (V) is,
loss of stock volume (V) = average stock volume per unit area (V') × forest death rate (P) × burnt area (S)

Every single tree is investigated, classified as burnt tree, wounded tree or non-wounded tree, and the losses are defined accordingly. Generally, forest loss degree is decided upon the damage of the crown, the cambium of trunk and the roots.

Burnt tree: more than 2/3 of the whole crown is burnt; more than 2/3 of the trunk cambium is burnt; the roots are severely burnt, and it is impossible to restore growth.

Wounded tree: 1/4 - 1/2 of the crown is burnt; more than 1/2 of the trunk cambium is not burnt; the roots are burnt but not severe, and it is still possible to grow again.

Non-wounded tree: the crown is not burnt; the trunk cambium is not wounded, only the bark is burnt; the roots are not damaged.

According to the above standards, count the numbers of burnt trees, wounded trees and non-wounded trees, and convert them into stock volume. The total loss of stock volume is estimated from it.

B. The determination of forest price of standing timber (T)
Due to the current price policy of China and the different situations in the forest areas, there are market price inverse estimating method, theoretical forest price estimating method and current planning price estimating method to determine the forest price of standing timber (T). These methods are established by the state, or practised in some local areas, or research result. After many years of study on forest price,

forest price system has begun to be applied in our country, and now it is being tested in the state-owned forest areas. After the forest price being standardized in our country by the state government, it would be used in the estimation of economic losses of forest fire. But before that, now the forest price is still not standardized, so we are thinking to use market price inverse estimating method and theoretical forest price estimating method in determinating the forest price of standing timber (T).

(a) market price inverse estimating method:

The formula for forest price of standing timber (T) is

T = timber market price - logging expenses - circulation costs

among which,

logging expenses: (I) logging expenses; (II) management expenses; (III) others

circulation costs: (I) transport costs; (II) loading and unloading expenses; (III) management expenses; (IV) others

(b) theoretical forest price method

According to the basic theory of forest resources reproduction and in order to ensure the reasonable profit of the forest resource producers, based on the real expenses and costs, we formulated the list of theoretical forest price of forest resources in our country, in which the price level of standing timber of each tree species at different ages can be directly found. Investigation can also be carried out in combination with the actual local situations.

Before closing of young stands, the loss can be estimated according to the number of trees lost. The price of a single tree can be obtained by the average cost of the survived trees per mu (100 mu = 6.6666 ha). The total cost per mu is the silvicultural costs of the first year plus young stand tending costs before closing.

(2) Direct Economic Loss

A. Timber, wood products and forest by-products: All the timber, sawtimber, wood products and forest by-products, etc. that are burnt or wounded by the reaching of forest fire at the places including logging site, mountain edges, middle edges and stocking yard.

(a) The formula for the estimation of the timber loss in the mountain yards as logging site, mountain edges and middle edges is:

loss (yuan) = quantity of lost timber (cum) $\times$ timber production cost price on mountain yards (yuan/cum) - left timber value (yuan)

(b) The formula for the estimation of the timber and sawtimber loss on stocking yards is:
loss (yuan) = quantity of lost timber (cum) × timber producer price (yuan/cum) − left timber value (yuan)

(c) The formula for the estimation of the loss of wood products and wood−based panel is:
loss (yuan) = quantity of wood products (ton or cum) × producer price of the product (yuan/cum, ton) − left value (yuan)

(d) The formula for the estimation of the loss of forest by−products is:
loss (yuan) = quantity of forest by−products (kg) × market price of the product (yuan/kg)

B. Fixed assets: The loss of fixed assets (including industrial or civil buildings, machines and equipments, instruments and meters, vehicles, boats and ships, etc.) burnt by forest fire is estimated by re−purchase complete value depreciation method. The formula is:
loss (yuan) = re−purchase complete value (yuan) × (1 − average rate of depreciation per year % × number of years of service) × burn rate (%)

Repurchase complete value refers to the money needed to rebuild or repurchase the fixed assets. The figures can be found from the local regulations of the house property administrative department and relative departments. If it cannot be determined under special circumstances, the original value can be used for estimation instead of repurchase complete value. Among the formula, burn rate refers to the real degree of burnt in terms of percentage.

The number of years of service of fixed assets and buildings can be found in the documents of "Trial Regulations on Fixed Assets Depreciation of State−owned Enterprise" and "Principle for the Inventory and Estimation of Leased Houses".

C. Mobile Assets refers to the property that takes part in the circulation during the production and management process and changes its forms, such as raw material, materials, fuel, being manufactured articles, semi−finished products, and products, etc. The formula is:
loss (yuan) = quantity of mobile assets × buying price − left value
It is estimated separately according to different kinds of mobile assets, and added up together.

D. Loss of products of agriculture and animal husbandry in forest areas: The loss of products of agriculture (such as grains, cotton and oil, etc.) and animal husbandry (such as animal and domestic fowl, etc.) in forest areas is estimated separately by each kind.

E. Cost of fire protection: This item is the annual average cost of purchasing various fire protection facilities and building fire roads and all the expenses of fire protection team, in order to prevent forest fire, within a certain period in the forest area, from which the cost of per unit area can be estimated according to how much forested area. The cost of per unit area multiplied by burnt area is the loss of fire protection expenses. The formula is:
fire protection cost (yuan) = fire protection cost per unit forested area × burnt area

(3) Indirect Economic Loss

A. Stop production, drop in production and close down of business refer to stop production, drop in production because of reducing managing activities and loss in the volume of business influenced by forest fire of the factories of timber production, wood processing, machinery and other industrial sectors and of the sale and commercial units of forest products. The estimation method is:
loss from stop production (yuan) = output of products per unit time × stop production time × ex-factory price per unit product
loss from close down of business (yuan) = turnover per day × number of days of closure

B. Personnel death and wound: According to the degree of wound it is devided into three classes. (I) light wound -- the wound that causes loss of ability and the loss is less than 105 working days; (II) serious wound -- the wound that causes loss of ability and the loss is 105 or more working days but less than 6,000 days; (III) death -- estimated as loss of 6,000 working days.
loss of personnel death and wound (yuan) = number of the dead and wounded (person) × number of working days lost ability (day) × salary of different staff (yuan)

C. On-the-spot rescue and treatment: includes materials used in fire suppression and the salary of fire fighting personnels.

D. Expenses of dealing with the aftermath:

(a) Costs of swamping fire slash and fire site, it is estimated according to the real costs.
(b) Pension and medical expenses for the dead and wounded people, it is estimated according to the real costs.

(4) Biological Economic Loss

Forest fire has destroyed the biological balance in the forest area, caused deterioration of biological environment, and reduced the

productivity of forest land. Moreover, the villages and farmlands nearby have lost shelter and are easy to be attacked by calamities as flood, drought, wind and sand, which endangers the agricultural production and the people's life, and leads to the deterioration of the production and life environment. Therefore, it is difficult to estimate accurately the loss on the biological environment caused by forest fire. Considering the current situations and possibilities, estimate only three kinds of loss, i.e. economic loss on forest tourism, economic loss on hunting and loss of wildlife. For the time being, it will be added and perfected by further research and practice.

A. Economic loss on forest tourism refers to the difference of economic incomes ex–fire and after fire in the forest areas and forest parks in the city where tourism has been developed, in the nature reserves, forest scenic spots and tourism area taking forest as the main attraction.
economic loss (10 thousand yuan) = average annual income of three years of tourism (10 thd yuan) – one year's tourism income after fire (10 thd yuan)

B. Economic loss on hunting refers to the difference of economic incomes ex–fire and after fire of forest hunting within the hunting limits permitted by the state.
economic loss (10 thd yuan) = average annual income of three years of hunting (10 thd yuan) – one year's income of hunting after fire (10 thd yuan)

C. Loss of wildlife refers to the economic value of lost wildlife in the forest area after forest fire.
loss of wildlife (yuan) = (quantity of wildlife per unit area ex–fire – quantity of wildlife per unit area after fire) × burnt forest area × average current price of wildlife

3. GRADING OF FOREST FIRE

Refering to the relevant standards of the state, forest fires are graded into three classes on the basis of the amount lost in resources, property and personnel death and wound caused by one forest fire:
Class I: extraordinarily serious forest fire, the loss of it is more than 500 thousand yuan;
Class II: serious forest fire, the loss of it is between 50 – 500 thousand yuan;
Class III: ordinary forest fire, the loss of it is less than 50 thousand yuan.