

THE FLOW CHART OF DETERMINATION OF DAMAGED FOREST AREAS BY MEANS OF SPACE IMAGES

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Intensity and size of the forests loss changes over the years, in the last decade the area of drying forests noticeably increased. During the ten-year period 1991-2000 it was revealed the dead stands area about 3559,0 thousand ha and during five years (2001-2005) already perished 2577,2 thousand ha. The ground-based forest pathologic inspection of the large territories of damaged forests requires high labor and financial cost. The alternative technological solution is oriented to the application of the remote sensing methods.

In acting forest instructions (2006) in order to recognize damaged trees in the upper trees cover one should have used the multispectral aerial photographs of scale 1:5000 - 1:10000, obtained in the second-half of summer period, i.e., after appearance the fresh dead wood (of present year) in the cover. The analysis of the informativeness of the high resolution space images shows that their depictive properties are similar in many respects to the materials of aerial photography. This circumstance served as base for using the QuickBird space images (SOVZOND authorized distributor) for the development of flow of damaged forest area determination. This direction completely corresponds to the purposes and the content of the forest pathology monitoring, which organization and holding is provided by the new Forest legislation of the Russian Federation (2007).

As the subject of studies it was selected the fir stands of Vodlozerskii national park, that suffered by windfall in 2000, which in the majority of the cases precede the mass multiplication of trunk wreckers (*Ips typographus*) and other forms of insects during the subsequent years. The QuickBird space images were used together with the bases of forest and cartographic data for national park.

Long-standing observations of the fir forest state and the dynamics of the wreckers number in the European territory of Russia give grounds to consider the mixed coniferous broadleaved forests, and also fir groves of the southern and average sub zone of taiga as the territory of the mass multiplication of *Ips typographus*. The majority of fir forests are infected by root rot. The infection of trees grows with the age of stand, and wind-resistance of stands is lowered with the progressive development of rot. The damage of forests by wind frequently becomes the natural calamity.

The common chart of works on forest damages estimation includes several stages. During the first stage using remote sensing data it is fixed the position of windfall and dead wood areas. Procedure includes classification (usually supervised) of the forest objects and conducting other procedures of images processing (masking of clouds, shadows). In this stage of works it is corrected the borders of the windfalls and dead forest areas and in GIS it is moved away the pixels of images which relate to the non-wooded lands and other use land types (swamp, forest on the swamp, scrubs and other).

The following stage is the determination of damaged forest area inside the economic forest compartment by combination of space images with the plan-cartographic materials of the digital forest management cartographic data base. On the base of these data it will update the forest data base by correcting of the volume of live and dead parts of the standing timber and also the species composition and volume density of damaged forests. If necessary obtained results are presented in the cartographic form for forest pathology monitoring.

Monitoring data are intended for updating the statistical forests state information of the Russian Federation subjects.