

# Interpretation of Forest Resource in Purple Mountain of Nanjing City, China Using WorldView-2 Imagery by Individual Tree Crown (ITC) Method

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**Abstract:** It is nearly impossible to get spatially-explicit forest information over large areas purely on the basis of field assessments. On the other hand, because of vast forests with a total area about 195.45 million hectares in 2008 in China, the national forest inventories for sustainable management of forest by sample plot method carried out by every five-year need too much cost and time. Therefore, how to accurately acquire spatially detailed forest information over large area by other enhanced methods has become an urgent issue of study. The appearance of remote sensing technique acquiring imageries with very high resolution of 1 m or less makes it possible for the task of delineating individual trees. But some technologies of interpreting imagery need to be developed further. This study attempted to measure forest resource at the level of individual tree using high resolution imagery by Individual Tree Crown (ITC) method, a semi-automatic approach of tree crown delineation with valley-following algorithm and tree top extraction with local maxima filtering technique. The used imagery was taken by WorldView-2 satellite on 10 December, 2011 with resolution of 0.5 m in panchromatic band and 2.0 m in multispectral bands. In this study, we selected the total mountain with an area of about 30 km<sup>2</sup> as the research object. Ninety plots with the size of 15 × 15 m, 20 × 20 m, or 25 × 25 m, distributed in different forest types, were established in September, 2011 for testing interpreted accuracy of tree tops and supervised classification on tree species. All trees which DBH was larger than 5 cm were surveyed, including species, DBH and height. Additionally, the centers of ninety plots were measured by GPS. We checked the matching of observed and estimated tree densities in every central point of plots and calculated interpreted accuracy of tree tops. The tops of trees in three groups: ≥ 10 cm, ≥ 15 cm, and ≥ 20 cm DBH, have been extracted by using filters with moving window of 3×3 pixels (1.5×1.5 m), 5×5 pixels (2.5×2.5 m), and 7×7 pixels (3.5×3.5 m) respectively. In the study area, there are 1,203,970 trees of DBH over 10 cm, and the interpreted accuracy is 73.68 ± 15.14 % averaged by the 90 plots. The number of the trees ≥ 15 cm and ≥ 20 cm DBH is 727,887 and 548,919 with average accuracy of 68.74 ± 17.21 % and 71.92 ± 18.03 % respectively. In addition, a thematic map of land cover and species distribution has been delineated by supervised classification. Finally, all of tree tops were endured with species attribute from the thematic map, and the number of them was counted for different species. The results indicated that the forests in Purple Mountain were mainly dominated by *Quercus acutissima*, *Liquidambar formosana*, and *Pinus massoniana* in

density, which was in accordance with forest inventory data.

**Keywords:** Remote sensing; Forest resource measurement; Individual Tree Crown method; Purple Mountain