Increasing and maintaining structural diversity in forest stands has become an important forest management strategy for adapting climate change. Furthermore, structural diversity is a straightforward indicator of potential biodiversity in forest landscapes because a diverse stand structure provides better habitat for forest-dwelling organisms. Therefore, a stand structural diversity map is needed for a wide variety of purposes related to biodiversity conservation, climate change adaptation and sustainable use of forest resources. Field-based methods are very expensive and time consuming for mapping stand diversity in particularly large forest areas. Also, aerial photography is a slow and time consuming process and often inconvenient to integrate into the now widely used automated data capture and GIS technologies. Large-scale satellite remote sensing data offers a cost effective alternative to aerial photo- and field-based methods. The aim of study was to predict and map stand structural diversity using RapidEye very high resolution satellite data in a forest located at the Mediterranean Region of Turkey. As the RapidEye with an additional red-edge band is a relatively new satellite system, its capacity on mapping the stand structural diversity has been not explored yet. Initially the image was segmented to generate meaningful objects by multiresolution segmentation algorithm. The first-order texture and second-order texture features based on Gray Level Co-occurrence Matrix (GLCM) as explanatory variables were calculated for each object. Forty objects were randomly selected and their corresponding stand diversity indices were determined using the field measurements. The Gini coefficient of tree diameters (DBH diversity) was used for quantifying stand structural diversity. A stepwise regression analysis was applied to predict the DBH diversity. As a result, our best model explained the variation of 66% in the DBH diversity (p<0.01). A cross-validation approach with leave %25 out sampling objects was performed to validate the reliability of the regression model. The cross-validation test yielded a $R^2$ of 0.63 (p<0.01), confirming that the predictive ability of the regression model was stable. Using this best-fitted model, the DBH diversity was mapped based on three diversity classes (low, moderate, and high). The accuracy of the resulting diversity map was evaluated using the independent 60 sampling plots. The overall accuracy for these classes was 86.6%. In conclusion, the stand structural diversity based on Gini Coefficient of tree diameters can be mapped at reasonable accuracy using the RapidEye data. This satellite-based diversity map may be useful data sources for wildlife and forest managers in their decision making process.