

MAPPING HISTORIC GYPSY MOTH DEFOLIATION WITH MODIS SATELLITE DATA: IMPLICATIONS FOR FOREST THREAT EARLY WARNING SYSTEM

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ABSTRACT

A case study was conducted to assess the potential of MODIS (Moderate Resolution Imaging Spectroradiometer) data for monitoring non-native gypsy moth (*Lymantria dispar*) defoliation of forests. Gypsy moth defoliation of broadleaved forests in the United States is specifically listed as a threat in the Healthy Forest Restoration Act (HFRA) of 2003. The HFRA mandates development of a national forest threat EWS (Early Warning System). The U.S. Forest Service Eastern and Western Forest Threat Assessment Centers are designing and building this system. NASA is helping the Forest Service to integrate needed satellite data products into the EWS. This activity includes the evaluation of MODIS data sources for supplying EWS forest disturbance monitoring products. This case study focuses on one facet of the EWS: the need for monitoring forest disturbance due to exotic insect defoliation.

Our presentation discusses results of the case study compared to EWS needs, such as producing early indications of forest defoliation using historic and current temporal composites of MODIS data. This study employed MODIS data collected over a 15.5 million-

acre mid-Appalachian Highland region during the annual expected defoliation timeframe of mid-June through July in 2000–2006. The study focused on 2001 defoliation because of available reference data during that year. Analysts computed and validated 2001 regional wall-to-wall defoliation maps from multiple MODIS products. We determined that MODIS time series data can accurately map regional historic gypsy moth defoliation (providing that temporal data processing was applied to data from the defoliation period). We used MODIS time series data to compute baseline NDVI (Normalized Difference Vegetation Index) levels of non-defoliated forests during the targeted timeframe. The latter can be compared to current conditions of the same timeframe to detect anomalous drops in NDVI due to defoliation. Temporal processing of MODIS NDVI data from the defoliation period proved effective even though clouds covered the study area about 80 percent of the targeted time. MODIS defoliation maps may aid airborne sketch map defoliation surveys, either in the planning stage or after the fact in terms of adjusting estimates of total defoliated area. More work is being done on other geographic regions and other years to further assess this promising application.