

Forest Response to Stress and Damage (FORSTAD), Spongy Moth Sub-Project

Adapted in part from: FOREST RESPONSES TO STRESS AND DAMAGE (FORSTAD) Annual Reports for 1991 & 1994 Principal Investigators: Gary Lovett, Charles Canham, Clive Jones, Richard Ostfeld

Background: The forests of the northeastern U.S. are subject to multiple anthropogenic stresses which have the potential to severely impact the composition and function of forest ecosystems. Among the most important stressors are air pollution, climate change, over-browsing by white-tailed deer, and periodic defoliation by the spongy moth. The Forest Responses to Stress and Damage (FORSTAD) project was a multi-investigator effort to monitor long-term changes in the structure and function of Hudson Valley forests and to understand the role of crucial stress and damage agents in producing those changes. The project emphasized a whole-ecosystem approach to forest monitoring, including both biotic and abiotic stressors and response variables. In addition to the monitoring program, the project included an integrative modeling effort and experiments designed to increase our understanding of ecosystem response to certain perturbations. The project included 4 main sub-projects: (1) nutrient cycling, (2) spongy moth dynamics, (3) small mammal dynamics and (4) vegetation dynamics. The description following is about the spongy moth sub-project.

Spongy moth (*Lymantria dispar*) is an introduced forest pest which has become a major source of forest stress and damage in the northeastern USA. Monitoring began at Cary Institute in 1981, prior to the onset of the FORSTAD project. At the time, there was neither a clear understanding of what caused population outbreaks, or a reliable means of predicting defoliation. In 1981, a pilot study was initiated at Cary Institute, to sample a wide range of habitats and the resident spongy moth population. Spongy moth egg mass data collection continued on an annual basis until 2010.

Also prior to the FORSTAD project, four additional research sites were monitored from 1983-1990 as part of a USDA Forest Service cooperative research program. The main objective was to delineate the causes of outbreaks, improve prediction of defoliation, and provide managers with better tools for spongy moth population management. The sites included Black Rock Forest NY, Bryant Mountain VT, North Stonington CT and Otis Air Force Base MA.

Methods: For the FORSTAD project, the basic methodology was to monitor density and survivorship of spongy moth life stages (with the exception of the adult moth) and associated habitat variables (tree species, height, diameter, canopy closure; elevation, slope, aspect). A series of 20, 75 m² plots on the Cary Institute Tea House Hill were sampled from 1981-2010. In addition, a 16 ha area on the North Cannoo Hill where 200 randomly located chestnut oaks (*Quercus prinus*) trees, half of which had burlap bands placed at 1.3 m (diameter at breast height) to facilitate counting spongy moths at low densities, were sampled from 1987-1998. Lastly, monitoring and experimental manipulations were done in 3 pairs (control, experimental) of grids 2.75 ha each from 1991-1998 (additional egg mass data from each of the grids were collected in 2002). Experimental manipulations included removal of small mammals and additions of acorns. Defoliation of trees by spongy moth occurred in 1981, 1989, 1990, and 1991.

The Cary Institute data repository has the following data items related to the FORSTAD spongy moth project. Note that more than one data file may be associated with each data item.

1. Oviposition Data
2. Egg Mass Dimension Data

3. Egg Mass Lab Data
4. Larval Data
5. Pupal Data, which consists of 2 sets of data
 - a. Pupal Density and Sex Ratio Data
 - b. Pupal Predation & Natural Pupation
6. Tree Data

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