Modelling the Pine Processionary Moth range expansion in the Paris Basin

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decay), and 5) two large trees (advanced decay). Pitfall traps were placed adjacent to the wood piles and carabid abundance, species richness, and species-level relationships were compared among the five DW classes. Five replicates of each DW class were chosen within each stand and twelve stands Michigan's Upper Peninsula were used for this study. Four stands were heavily infested with beech bark disease, four stands were selectively thinned ten years prior to this study, and four stands were undisturbed. Carabid abundance and species richness increased as volume and decay of DW increased. Carabid abundance was highest in stands with beech bark disease which may be due to increased DW available from beech tree mortality. Overall advanced-decayed wood had significantly higher carabid abundance and species diversity compared to wood in the early decay stages. Carabid abundance among DW classes varied by species with seven out of nine species highly correlated with specific DW types. Since certain species favored specific DW classes preliminary results suggest that a variety of types of DW is necessary to maintain biological diversity within forest stands.

MODELLING THE PINE PROCESSIONARY MOTH RANGE EXPANSION IN THE PARIS BASIN

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The geographic range of the winter pine processionary moth (PPM), *Thaumetopoea pityocampa* (Den. & Schiff.) (Lep.: Notodontidae) is currently expanding northwards and at higher elevations in South-central Europe. For example, in the Paris Basin the PPM front has shifted northwards by 5.6 km per year during the last 10 years while the minimum winter temperatures increased by about 1°C.

In order to understand this expansion process and the effect of climate warming on PPM dynamics, we coupled several models: a diffusion model to describe the dispersal capacity of the female moths, a delayed Ricker model to describe the population growth and its self-limitation according to pine density, and a mortality function associated with climatic conditions. The mortality function was based on the climatic conditions required by the PPM larvae to feed on needles, i.e; a nest temperature above 9°C during the day and an air temperature above 0°C during the following night. These eco-physiological constraints were determined by lab and field experiments. When we reconstructed PPM feeding ability in the Paris Basin during 1992-1996, we observed that this area was divided into two zones favourable for PPM development, a southern area around Tours (historically colonized) and a northern area near Paris (not colonized), crossed by a stripe where conditions were not favourable. PPM feeding conditions became more favourable in 2000-2004, and the in-between stripe finally turned favourable enough to enable PPM to progress towards Paris. The mean of minimum temperatures from October to March was identified as a simple climatic indicator of the feeding ability. This variable clearly showed a warming trend since the late 1980s. Since PPM would encounter favourable conditions nearly everywhere in the Paris

Basin, the effective shift would mainly depend on its dispersal capacity and the pines distribution.

Our mathematical model supplied a nice simulation of the past dynamics of PPM (especially the retraction of PPM front during cold winters) as well as the expansion since the early 1990s. We also showed that females could disperse at longer distance than previously known *i.e.* within 3-4 km *vs* 2 km. When a GICC climate scenario for next 50 years was included, the model forecasted that PPM could arrive in downtown Paris by 2025 if nothing is done to slow its spread.

The Use of Mobile Mapping Technology to Automate Surveying and Monitoring Southern Pine Beetle Infestations: Development and Implementation

Saul D. Petty, USDA Forest Service, Forest Health Protection

This poster deals with the development and subsequent implementation of a mobile mapping system designed to improve data collection and storage for the Southern Pine Beetle Information System (SPBIS). SPBIS is an ORACLE database which is maintained by the USDA Forest Service, Forest Health Protection. Improvements to SPBIS will aid in management of Southern Pine Beetle (SPB) infestations to reduce losses, and to assist resource managers. The time required to manually enter data into the database is substantial. Due to negligent data entry practices the database is lacking many years of survey and infestation data which limits its usefulness. This system introduces a custom digital data collection form which runs within ArcPad® mobile GIS software. Ultimately, this system eliminates the need for manual entry of field-collected data, while improving field data collection in terms of efficiency and accuracy. The system is currently in the implementation stage. National Forests in Alabama have been trained to use the system operationally and National Forests in Mississippi are scheduled for training in early summer 2006. The system will eventually be distributed throughout the Southern Region (R8). Development of the system will be continuous to keep pace with changing technologies.

Development and Evaluation of an Improved Releaser for Bark Beetle Semiochemicals

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Semiochemicals have been used for decades to affect behavior of bark beetles. Extensive evaluation in the laboratory and field has produced many attractant and antiaggregant compounds; however, results have been inconsistent when semiochemicals have been applied