ML 2015, Ch. 76, Art. 2, Sec. 6a Project Abstract
For the Period Ending Dec 31, 2021
Amended December 8, 2022

PROJECT TITLE: **MITPPC #5: Optimizing tree injections against emerald ash borer**
PROJECT MANAGER: **Brian Aukema**
AFFILIATION: **University of Minnesota**
MAILING ADDRESS: **1980 Folwell Avenue**
CITY/STATE/ZIP: **St. Paul, MN 55118**
PHONE: **(612) 624-1847**
E-MAIL: **BrianAukema@umn.edu**
WEBSITE:
FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: MINNESOTA INVASIVE TERRESTRIAL PLANTS AND PESTS CENTER
ML 2015, Ch. 76, Art. 2, Sec. 6a

APPROPRIATION AMOUNT: $318,927
AMOUNT SPENT: $318,927
AMOUNT REMAINING: $0

Sound bite of Project Outcomes and Results

Emerald ash borer continues to spread and devastate Minnesota's urban forests, but deploying the right types of insecticides to ash trees in the right ways can offer tree conservation and protection with minimal risk to non-target organisms such as bees that visit flowers and worms that decompose leaves.

Overall Project Outcome and Results

Emerald ash borer is an invasive insect that kills mature ash trees and has been spreading within Minnesota since its detection in 2009. Ash is a major component of many of Minnesota's urban forests. Injections of insecticides into ash trees can preserve trees indefinitely, but raises concerns for non-target organisms in the environment such as bees and earthworms. For this study, we injected subsets of 1200 trees located in eight different cities in Minnesota with two different insecticides. We specifically tested products that were not neonicotinoids that have presented past risks to pollinators. Insecticides were injected into the trunks in summer of 2017, with periodic reapplications until 2020 while we measured crown health of each tree each summer until 2021. The original site selections were in cities with low pressure from emerald ash borer. We found over the four years of the study that injecting only half of the trees in a given site gave good protection to all trees. We were unable to determine, however, whether this associational protection (i.e., preservation of canopy in an untreated tree when proximate to a treated tree), winter mortality to EAB, or some combination of both was responsible for the site-wide excellent conditions that persisted five years after EAB was present in these communities. Measurements of tree phenology such as leaf out and leaf drop showed that insecticides did not alter the timing of such events. One of the insecticides, emamectin benzoate, showed excellent protection of ash seeds against seed weevils by the third year of the study, without affecting seed viability. We also canvassed the insect communities that visited the trees and harvested leaves for feeding trials with nontarget organisms, and measured chemical concentrations in the leaves. We found that insects communities were similar between treated versus untreated trees across seasons, that bees preferred visiting synchronously flowering plants such as flowering crab apples and rhododendrons versus ash trees, that trunk-injected chemicals were not reliably detected in all plant parts after injection, and that invertebrates such as worms showed no reduction in reproduction or feeding on treated leaves. As such, we concluded that detrimental effects of the insecticides tested on non-target organisms are not likely to be ubiquitous or widespread. In

summary, when homeowners or communities are selecting a product to preserve urban ash trees, we recommend emamectin benzoate as a suitable and effective alternative to neonicotinoid-based products.

Project Results Use and Dissemination

This work has been submitted for publication at two peer-reviewed journals, with two more submissions planned. The work has been presented at regional, national, and international venues including workshops and conferences such as the Shade Tree Short Course, the Entomological Societies of Canada and America, the IUFRO Conference on Biological Invasions of Forests, the North American Forest Insect Work Conference, the Upper Midwest Invasive Species Conference, the USDA Interagency Annual Forum, and the North Central Forest Pest Workshop. A number of presentations were also given to local community forestry and resource manager groups throughout the project, and we enjoyed a high number of interactions with members of the public while working in their communities.