# Monitoring and Managing Ash (MaMA): a program that enables lingering (resilient) ash detection

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## What is MaMA?

**Monitoring and Managing Ash (MaMA)** is a program of the Ecological Research Institute (ERI) that enables widespread detection of strictly defined **lingering ("resilient") ash**, chemically untreated mature (≥4" dbh) trees that retain healthy crowns through peak EAB invasion. Crucially, they are not trees that merely survive peak invasion nor are they trees that reach maturity after the onset of peak infestation (ingrowth in the aftermath of peak EAB). The U.S. Forest Service EAB Resistance Breeding Project has shown that scion (twigs) collected from them can be grafted to form clone banks and then used for selective breeding to yield highly EAB-resistant native ash.

Developed in 2017 in close consultation with Drs. Jennifer Koch and Kathleen Knight of the USFS EAB Resistance Breeding Project, MaMA has been implemented in Vermont and New York since 2018. It now features prominently in the Tree Species in Peril collaborative initiative led by the USFS and The Nature Conservancy, enabling MaMA to expand throughout New England.

In long-invaded areas of New York, MaMA has already detected 180 lingering ash, including representatives of all three widespread Northeastern species (white, green, black/brown); some of these have furnished material for EAB resistance breeding at Cornell University. MaMA's ability to find lingering ash is based on large-scale data collection along with the integration of lingering ash detection into ash management. Both components are enabled by MaMA's partnerships with agencies, conservation NGOs, researchers, professional land managers, and community scientists.

*NYC DEP's invasive species specialist marking lingering ash; photo by R. Wildova.*
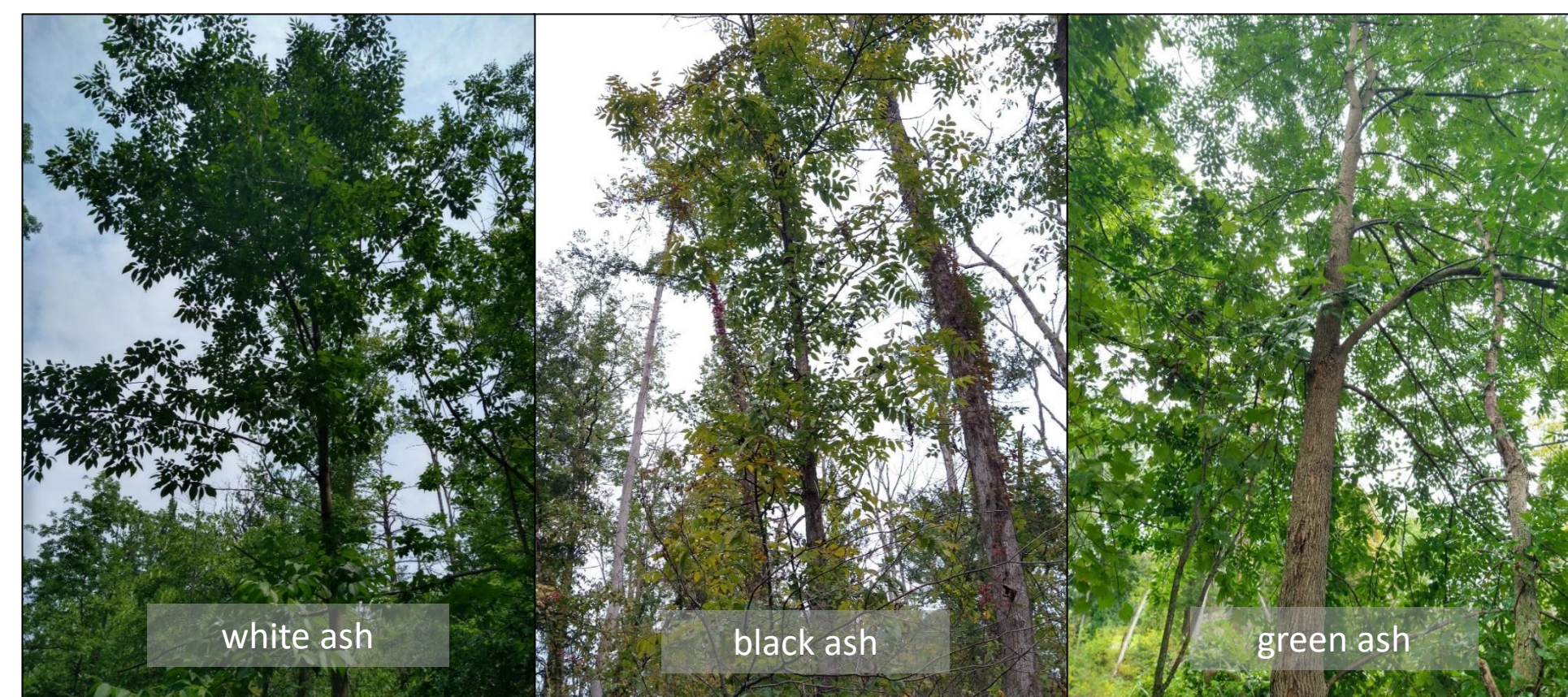
*Examples of lingering ash found in New York; photos by R. Wildova.*

white ash | black ash | green ash
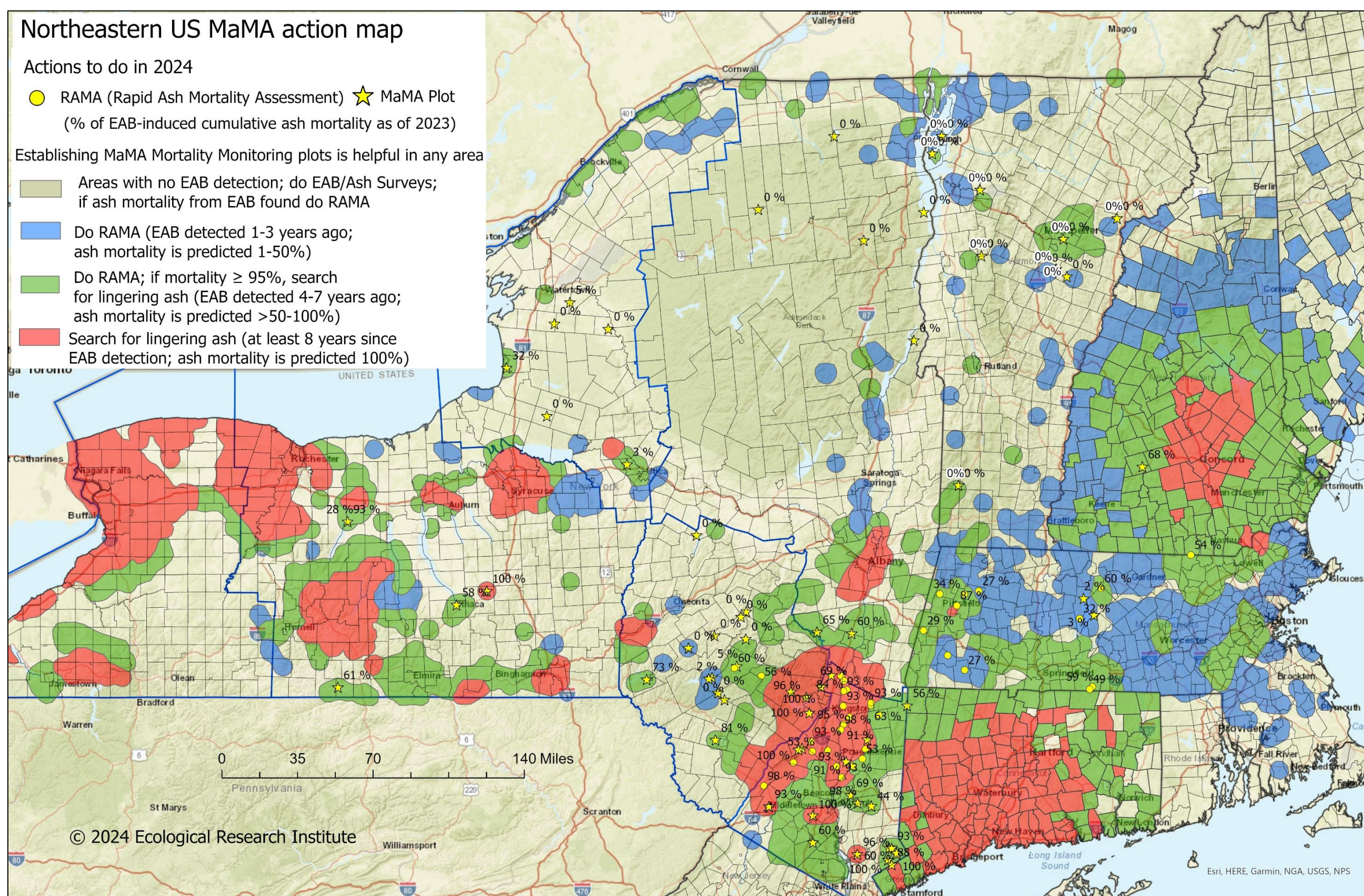
## Acknowledgements

## Lingering ash criteria and timing

Based on the criteria of the USFS EAB Resistance Breeding Project, for a tree to qualify as a lingering ash for the MaMA program, it must be a chemically untreated, mature tree (at the time of peak EAB pressure) that retains a healthy crown for ≥ 2years after ≥ 95% of the mature ash in the area were killed by EAB. Thus, finding lingering ash depends upon searching for them in the areas in which this mortality threshold has been reached.

Searching before then will likely produce false positives, i.e., trees that were not yet tested enough by EAB. However, searching too late is also problematic, because: 1) even rigorously defined lingering ash can eventually succumb to EAB or other causes; and 2) post-peak ingrowth can occur, with healthy trees that haven't experienced peak EAB pressure being mistaken for lingering ash. MaMA's "action maps", yielded by data from its projects and other sources, enable looking for lingering ash in the right places at the right times.

## MaMA's action maps

MaMA's annually updated action maps show: 1) areas known or projected to be ready to search for lingering ash; and 2) areas needing more data and which MaMA project to use to collect it. The maps are initially created using EAB detection data (mostly from state agencies, but also other sources) along with standard mortality trajectories and spread rates to project when and where 95% mortality will be reached, but they are then refined and updated using mortality and health data collected by MaMA projects. Although the color-coded zones are coarse, MaMA offers guidance in interpreting them to reflect differences in mortality trajectories between species or due to environmental variables.

**Northeastern US MaMA action map**

Actions to do in 2024

🟡 RAMA (Rapid Ash Mortality Assessment)   ⭐ MaMA Plot
(% of EAB-induced cumulative ash mortality as of 2023)

Establishing MaMA Mortality Monitoring plots is helpful in any area

Areas with no EAB detection; do EAB/Ash Surveys; if ash mortality from EAB found do RAMA

Do RAMA (EAB detected 1-3 years ago; ash mortality is predicted 1-50%)

Do RAMA; if mortality ≥ 95%, search for lingering ash (EAB detected 4-7 years ago; ash mortality is predicted >50-100%)

Search for lingering ash (at least 8 years since EAB detection; ash mortality is predicted 100%)

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*To access MaMA action maps, go to www.monitoringash.org/mama-action-maps; for MaMA project data forms and handouts, go to www.monitoringash.org/data-forms-for-mama-projects.*

*If you want to find out more about lingering ash and the MaMA program, please visit www.monitoringash.org or email us at outreach@monitoringash.org.*
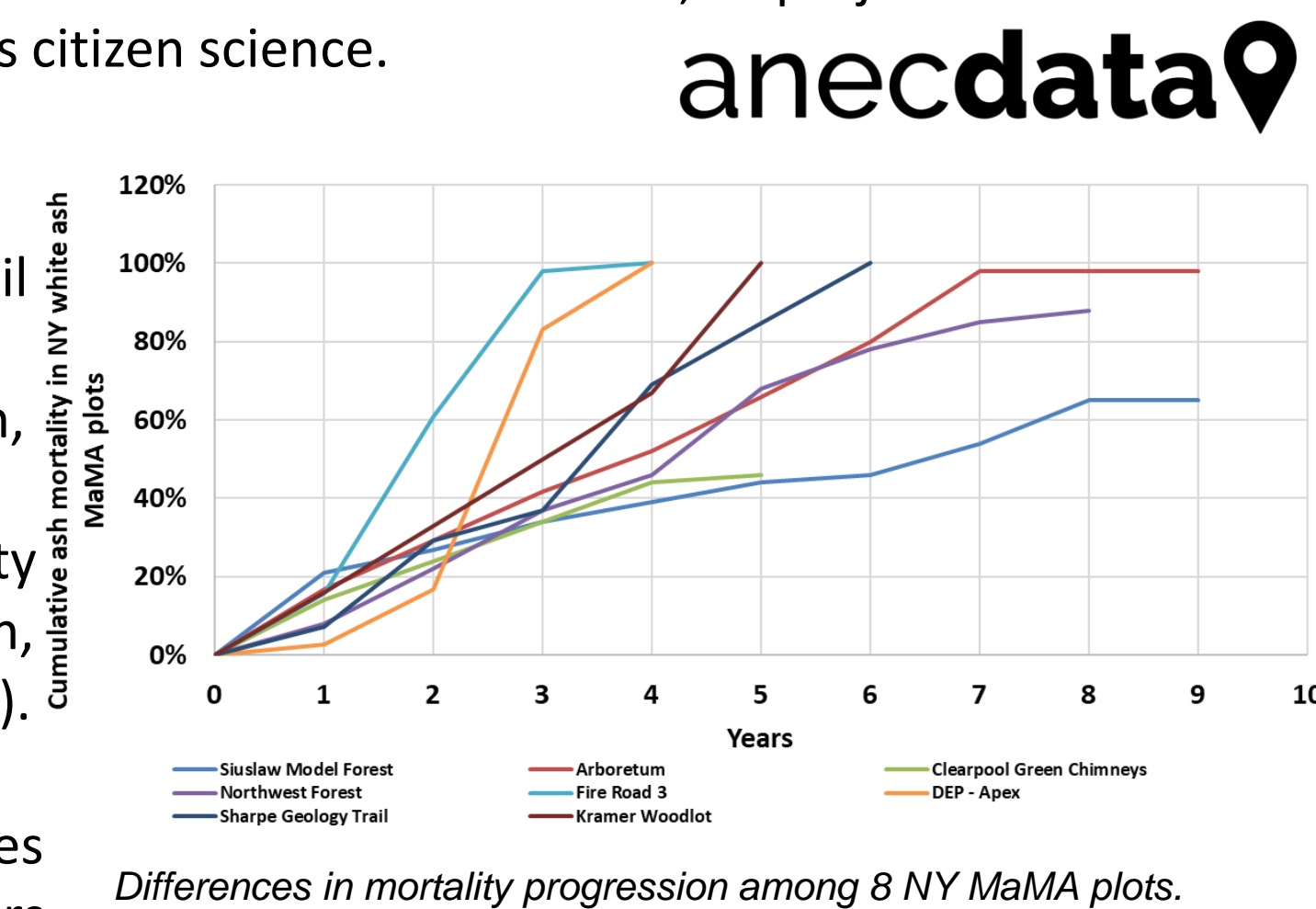
## 4 MaMA data collection projects

Participants can choose how many and which of these to participate in based on their interest and capabilities and the EAB status in their area; all projects are on **Anecdata**, a platform for rigorous citizen science.

**1.** Participation in the **MaMA Monitoring Plots Network** comprises monitoring 40 ash until they die. In addition to helping guide the search for lingering ash, data from the plots has revealed considerable variation in mortality trajectories (at least for white ash, for which we have the most data). This variation has management implications, since in some locales die-off is much slower than others. Additionally, we are investigating the extent to which mortality trajectories are influenced by particular environmental variables, which may enable more refined prediction of ash decline rates.

*Differences in mortality progression among 8 NY MaMA plots.*

Cumulative ash mortality in NY white ash MaMA plots (y-axis: 0%–120%); Years (x-axis: 0–10)

Siuslaw Model Forest, Northwest Forest, Sharpe Geology Trail, Arboretum, Fire Road 3, Kramer Woodlot, Clearpool Green Chimneys, DEP - Apex

**2. MaMA Rapid Ash Mortality Assessments (MAMA RAMAs),** although less precise than monitoring plots, still helps reveal where and when to search for lingering ash. Unlike the plots, which can be established at sites even before they are invaded by EAB, MaMA RAMAs are only for sites that already have EAB-induced mortality.

**3.** In areas where EAB has already killed the vast majority of trees, **MaMA Lingering Ash Search** enables reporting trees that meet the strict criteria, as well as negative results of systematic searches.

**4.** In MaMA Ash/EAB Surveys, presence/absence of definitive EAB evidence (and whether any trees with such evidence have died) are reported, complementing state detection data.

*Vermont Land Trust crew establishing brown ash MaMA plot; photo by R. Wildova.*

## Data confidentiality and stewardship

Location data of lingering ash is never made publicly available. Additionally, it is up to the land stewards whether to publicly share the locations of their monitoring plots.

## Combining LA detection and seed collection

Those involved in lingering ash detection can put their knowledge to use in seed collection and vice versa. Moreover, seed collection can be targeted at lingering ash. Therefore, we are facilitating connections between these two approaches to ash conservation.