



Great Lakes Basin Forest Health Collaborative



**Annual Partners Report
October 2023–September 2024**

**Dr. Rachel Kappler, Forest Health Collaborative Coordinator, Holden Forests & Gardens
October 2024**



Our mission

**The mission of the Great Lakes
Basin Forest Health
Collaborative is to support
partners involved in invasive
pest and disease resistance
breeding for Great Lakes trees.**

**Our goal:
Healthy forests for the future**

Dear Partners,

It's a pleasure to serve as a liaison between partners to help facilitate our common goals. Breeding trees takes time and space, but it's worth the effort to keep tree species present within our forests. In this year's report you will find our progress from within the last 12 months. I'll continue to build our network and strengthen our efforts over the next year.

Thank you for all your hard work.

Rachel Kappler



Rachel Kappler, Ph.D.
GLB FHC Coordinator
Holden Forests & Gardens
October 22, 2024

Focal tree species

Eastern Hemlock

(Tsuga canadensis)

Hemlock woolly adelgid (HWA) invaded in 1951. It has not reached the entire eastern hemlock range, and not all trees in the Great Lakes region are infested. Research is ongoing to assess HWA impact and how to test for resistance within individuals.



Ash

(Fraxinus spp.)

Emerald ash borer (EAB) invaded in 2002 and has now reached much of the ash range. In the Great Lakes region, stands furthest north have not reached high mortality. Known EAB-resistant green and white ash from southern Michigan and Ohio have been confirmed to pass the resistance trait to offspring.



American Elm *(Ulmus americana)*

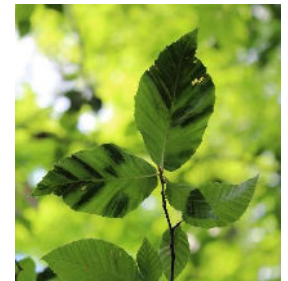
Dutch elm disease (DED) invaded in 1928 and has reached all of the American elm range. In the Great Lakes region, DED-resistant elm have been found and tested, and are confirmed to have resistance high enough to support reforestation research.



American Beech

(Fagus grandifolia)

Beech bark disease (BBD) invaded in 1929 and Beech leaf disease (BLD) invaded in 2012. Not all of the beech range has been infested with BLD. The Great Lakes Region beech has a small group of BBD resistant trees, but further research on how to test for BLD resistance is needed before we proceed further.



Forest health issues

Focus on pests & diseases

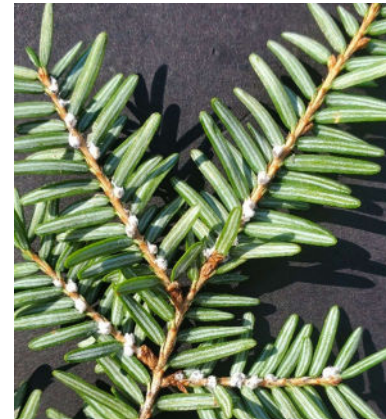
Forest health issues can include many types of disturbances. This grant initiative focuses on pests and diseases that directly affect specific species. Other species of concern may be added in the future.



Emerald ash borer



Beech leaf disease & Beech bark disease



Hemlock woolly adelgid



Dutch elm disease



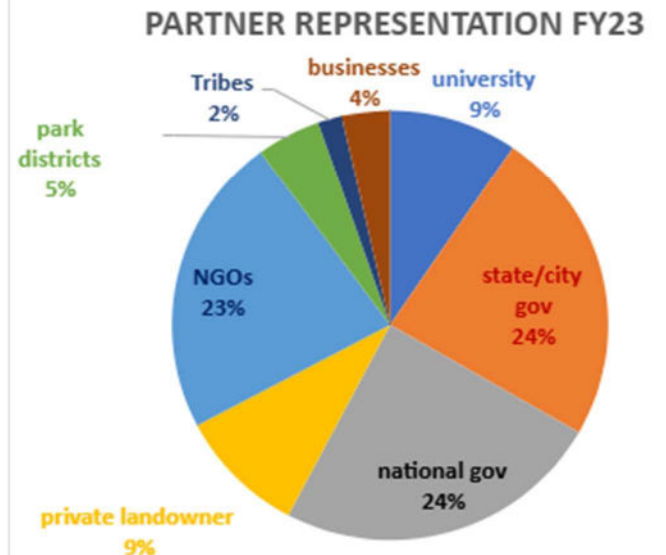
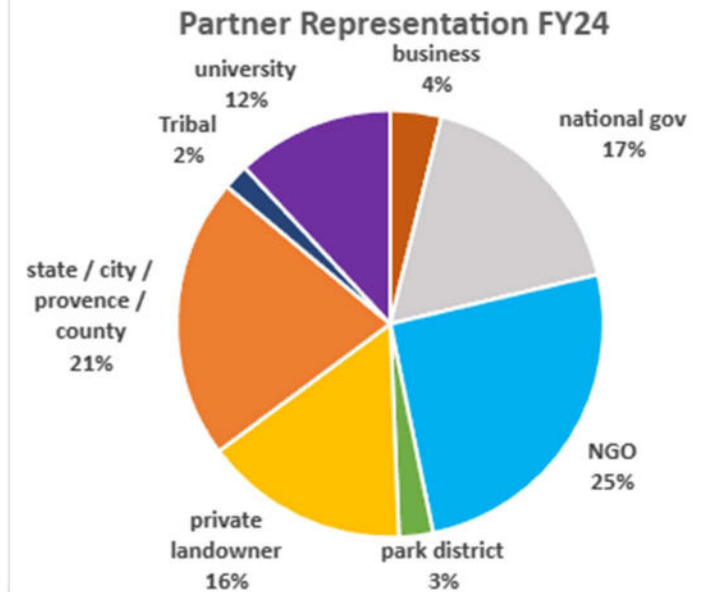
Great Lakes Basin Forest Health Collaborative



310 partners and counting

A forest health collaborative

- 310 partners (as of August 22, 2024)
- 5 in-person presentations
- 5 online presentations
- 14 workshops held for 130 participants, including:
 - 1 ash monitoring and EAB trap training
 - 4 lingering ash training
 - 1 lingering hemlock and plot monitoring training
 - 6 ash scion collection and hot callus grafting
 - 1 seed collecting, cleaning, and storing
 - 1 Holden Forests & Gardens interdepartmental collaboration workshop
 - 1 Tree Species in Peril (The Nature Conservancy) collaboration workshop



Getting the word out

The word in the trees is: You want to know more

- 1,400 webpage visitors
- GLB FHC e-newsletter sent quarterly to 170 people
 - Aug 19, 2024: [Quarterly Newsletter](#)
 - May 28, 2024: [Quarterly Newsletter](#)
 - Feb 22, 2024: [Quarterly Newsletter](#)
 - Nov 16, 2023: [Quarterly Newsletter](#)
- 80 public email inquiries answered
- 5 articles published with Holden Forests & Gardens
- 3 articles published in news outlets:
 - [Holden Arboretum Seeks Public Health to Research Beech Leaf Disease](#) (*The News-Herald*)
 - [Wave of defense tactics aim to save eastern hemlocks](#) (*Bay Journal*)
 - [If you have this tree, contact NE Ohio researchers](#) (*Fox 8 and Yahoo! News*)
- 1 radio [interview with Ideastream Public Media](#)



Ash updates

- The U.S. Forest Service has assessed the germination rate of EAB-resistant ash seed lots to identify which are high enough quality to be included in progeny plantings. Plantings will be established in 2026 to rate the resistance of the progeny trees against EAB over time.
- 160 new lingering ash reported this year!
- Grafting of lingering ash is now happening at Onconto River Seed Orchard (Wisconsin) and Cornell Botanical Gardens (New York); Penn Nursery (Pennsylvania) & Forest Gene Conservation Association (Ontario) to join soon.

Research highlights:

- European ash genotypes with increased resistance to ash dieback pathogen (*Hymenoscyphus fraxineus*) show cross-resistance to emerald ash borer. [[Gossner et al. 2023 New Phytologist](#)]
- J. Hamilton, K. LoPiccolo, & A. Melton (Pennsylvania State University) are assessing landscape genomic variation in multiple ash species.
- M. Staton, Romero-Severson, & Z. Smith (University of Tennessee) are working on long read assemblies in five ash species, including lingering ash individuals.





Eastern hemlock updates

- Outreach and education collaborations between Cornell extension, Hemlock Restoration Initiative, Holden Forests & Gardens, NC State Univ., and Adventure Scientists have spread across much of the eastern hemlock range to help researchers find lingering hemlock trees or set up long term monitoring.

Research highlights:

- K. Fetter, J. Wegrzyn (University of Connecticut - UConn) are assessing landscape genomic variation of eastern hemlock.
- J. Wegrzyn, et al. (UConn) completed the first reference genome for eastern hemlock. (publication to come)
- A. Glendening and N. Pauloski (UConn) with G. Burke and D. Dial (University of Georgia) continue to work on genome assemblies for the reference genome.
- M. Myles, T. Cernak, R. Kersen, S. Johnson, K. Fetter, B. Smith, and V. Vuruputoor (UConn & University of Michigan) are collaborating to assess seasonal terpene defense production in hemlock.
- D. Dlugos, D. Burke, C. Obrebski, and M. Pitts (Holden F&G) are continuing work on hemlock propagation best practices.
- C. Partridge, Sanders, et al. (Grand Valley State University) have been implementing the new eDNA collection method for HWA early detection in many locations across the Great Lakes Region.

American elm updates

- New planting going in Toledo, Ohio area at Metroparks Toledo; Blue Creek Native Nursery to serve as a seed source for the area
- Outreach is ongoing to inform partners and the public on how to ID and report survivor elms.
- 6 new survivor American elms reported this year

Research highlights:

- USFS research points to the use of 1-year-old seedlings for DED resistance testing; previously 7-year-old trees were used. [Charles E. Flower, Nancy L. Hayes-Plazolles, Cornelia Wilson]
- How an elm responds metabolically and physiologically to inoculation with *Ophiostoma novo-ulmi*, the fungi that causes Dutch elm disease, varies depending on elm species and drought stress, and differs across organs (e.g. main stem vs. branches). [[Rodríguez-Calcerrada et al. 2023 in Monitoring Forest Damage with Metabolomics Methods](#)]





American beech updates

- Holden researchers started growing American beech rootstock.

Research highlights:

- C. Partridge developing eDNA method for BLD nematode
- A collaboration led by a USDA-ARS team investigated what cellular changes lead to the leaf symptomology of BLD. [[Vieira et al. 2023 PLOS ONE](#)]
- MSU researchers Nick Zoller and Deborah G. McCullough reassessed plots monitoring beech bark disease after 20 years. The “proportion of beech basal area killed by beech bark disease has increased from 5% in 2003 to 24% in 2013 to 36% as of 2023. An average of 58% and 22% of beech basal area is now dead in the U.P. and Lower Michigan sites, respectively. The good news is that all leaves tested were negative for beech leaf disease. [[MiDNR Forest Health Highlights Report 2023](#)]
- Nematodes can be found in asymptomatic beech. Fungi, but not bacteria, on leaves were significantly different based on nematode presence; both differed based on symptomology despite occurring widely, suggesting possible opportunistic infection. [[Burke et al. 2024 Environmental Microbiology](#)]
- B. Shepherd, K. Stuble et al. (Holden F&G) established new BLD monitoring plots in 3 states to understand long term forest response at a larger scale.



Thank you, partners!

The GLB FHC is sponsored by Holden Forests & Gardens and the USDA Forest Service with funding support from the Great Lakes Restoration Initiative.

Rachel Kappler, PhD, is the coordinator for the GLB FHC. As the liaison between partners for the collaborative she hosts connects partners, hosts workshops, and presents at various conferences and webinars to help achieve the collaboratives forest health goals.

If you have any question or would like to get involved, please email her at rkappler@holdenfg.org.

