

WHERE ARE WE NOW AND WHERE DO WE NEED TO GO?

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ABSTRACT

The Hemlock Woolly Adelgid Management Initiative is an integrated pest management (IPM) plan that develops and implements management strategies that reduce hemlock woolly adelgid (HWA) impacts. This symposium is one product of the HWA Initiative. The manuscripts and posters presented represent a significant increase in our knowledge and demonstrate how this information is used to implement management actions in the field. I commend the authors of both oral and poster presentations for their efforts and sharing this information.

The spread and impact of HWA continues at an alarming rate, particularly in the South, and we cannot afford complacency. We need effective management tools for resource managers faced with the onslaught and aftermath of this devastating pest. We will continue to assess our knowledge, focus on critical data gaps, and accelerate efforts to implement promising management strategies. As part of the HWA Initiative and in response to the information provided at this symposium, the following areas of research, technology development, and management are currently planned or will be considered for further action in the near future.

KEYWORDS

Hemlock woolly adelgid, HWA Management Initiative, management tools, research, technology development.

BIOLOGICAL CONTROL

Biological control is an important component of the HWA Initiative and is crucial to minimize hemlock impacts in forest ecosystems.

PLANNED ACTIVITIES:

1. Continue to rear, release, and evaluate for establishment and efficacy *Laricobius nigrinus*, *Scymnus sinuanodulus*, and *Sasajiscymnus tsugae*.
2. Accelerate foreign exploration efforts in China and Japan to locate additional natural enemies and streamline the overseas screening process to expedite the shipment of promising species for further evaluation and, if appropriate, their release and establishment.
3. Evaluate the environmental and ecological factors influencing establishment and spread of biological control agents.
4. Continue to evaluate the role pathogens play in controlling HWA populations and assess their potential as a management tool.

PROPOSED ACTIVITIES:

1. Test the hypothesis that a complex of natural enemies is needed to effectively reduce and maintain HWA below damaging thresholds.
2. Accelerate efforts to develop an artificial diet suitable for rearing HWA predators.

CHEMICAL CONTROL

Chemical treatment of individual trees or a group of trees is costly and labor-intensive, but current technology does offer a short-term alternative for protecting high-value trees.

PLANNED ACTIVITIES:

1. Prepare a risk assessment covering the use of imidacloprid in forest environments.
2. Develop cost-effective methods to detect and quantify imidacloprid parent compounds and its metabolites.
3. Continue to evaluate more cost-efficient means of applying chemical treatments.
4. Continue to provide technical and financial assistance to state and federal agencies to suppress HWA infestations on public lands.

PROPOSED ACTIVITY:

- Evaluate hemlock wound response to trunk-injected systemic treatments.

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HOST RESISTANCE AND GENETIC PRESERVATION

Many areas have been severely impacted by HWA infestations, and resource managers are now facing rehabilitation and restoration decisions. The genetic diversity of eastern hemlock and Carolina hemlock may be threatened by the continued spread of HWA.

PLANNED ACTIVITIES:

1. Initiate seed collections of eastern hemlock species throughout their range to preserve genetic diversity and provide for reestablishment, if needed.
2. Establish suitable locations for planting collected Carolina hemlock seed outside of the general HWA-infested area.
3. Identify genetic and/or chemical host resistance mechanisms.

PROPOSED ACTIVITY:

- Determine whether existing hemlock species or cultivars have resistance to HWA and can occupy niches currently occupied by eastern hemlock.

SILVICULTURAL MANAGEMENT

Recommendations for silvicultural management of hemlock in advance of and following HWA infestations are limited. Preemptive cutting of eastern hemlock prior to infestation has become a common practice in New England.

PLANNED ACTIVITY:

- Determine whether improving tree vigor through various thinning practices in advance of an infestation can reduce hemlock mortality following an infestation.

PROPOSED ACTIVITY:

- Establish demonstration areas where existing mitigation, restoration, and rehabilitation management strategies can be evaluated.

BIOLOGY

HWA has an extremely complex biology affected by various physiological and ecological factors. Understanding how these factors affect HWA populations may offer new opportunities for management.

PLANNED ACTIVITIES:

1. Continue to assess how winter mortality affects HWA establishment and impacts across the Northeast.
2. Continue regional assessment of HWA genetics.
3. Continue assessment of bacterial endosymbiont diversity associated with HWA.
4. Assess tree and pest response to micronutrient applications.

PROPOSED ACTIVITY:

- Determine the role of microsporidia and fungal pathogens in HWA populations and natural enemies

IMPACT ASSESSMENTS

Eastern hemlock occurs in a broad geographical area scattered throughout the East in forests dominated by hemlock, other conifers, and mixed hardwoods. Currently, few resource managers have adequate inventories or maps of existing hemlock resources, thus making impact assessments difficult.

PLANNED ACTIVITY:

- Continue assessment of hyperspectral and other remote sensing technologies and their utility for mapping and measuring changes in hemlock health.

SURVEY AND MONITORING

Many state forest health specialists have limited knowledge of hemlock resource locations, and detecting new or low-level infestations is difficult because of the small size of the insect and its feeding habits and dispersal patterns.

PLANNED ACTIVITIES:

1. Standardize survey methods to detect and monitor HWA populations.
2. Continue to provide technical and financial assistance to state and federal cooperators.
3. Provide annual regional summaries of hemlock conditions and county-level HWA infestations.

PROPOSED ACTIVITY:

- Determine the utility of hyperspectral technology to detect low-level infestations by focusing on year-to-year changes in spectral reflectance and tree stress.

INTERACTIONS WITH OTHER PESTS

The elongate hemlock scale (EHS) is another exotic pest that threatens eastern hemlock. In many areas, EHS populations have surged on hemlocks previously stressed by HWA, causing further hemlock decline and mortality.

PLANNED ACTIVITIES:

1. Continue assessment of the EHS range and impacts throughout the East.
2. Determine the extent and impact of existing EHS natural enemies.
3. Evaluate the existing natural enemy complex of EHS in its home range (Asia) and classical biological control opportunities in the eastern U.S.
4. Evaluate entomopathogens and their potential for biological control of EHS.
5. Evaluate interactions between EHS and HWA and their impact on hemlock health.
6. Evaluate potential insecticides and application methods for EHS.

PUBLIC AWARENESS AND INFORMATION TRANSFER

PLANNED ACTIVITIES:

1. Continue to update the HWA website with new information and useful publications.
2. Provide funding to state and federal agencies to support public awareness activities.
3. Publish and distribute proceedings of the Third Symposium on HWA in the Eastern United States.
4. Update, print, and distribute the “HWA Pest Alert” to state and federal cooperators.