Hemlock Woolly Adelgid Newsletter *Issue No. 4*
USDA Forest Service, Northeastern Area State & Private Forestry
Forest Health Protection

The Hemlock Woolly Adelgid (HWA) Newsletter is a service of the USDA Forest Service, Northeastern Area in support of the HWA Working Group. This informal newsletter is intended to provide brief updates to those interested in activities associated with the hemlock woolly adelgid. For purposes of brevity, some of the articles may have been edited. Readers are encouraged to contact the individual authors if more detailed information is desired. The HWA Newsletter will be prepared and distributed at least annually or as sufficient new information becomes available. Comments, questions, and contributions for future newsletters are welcome and may be submitted to:

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FOREST HEALTH AND ECOLOGY

The Game of "Catch-Up"

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Based on the number of newspaper articles, phone calls and email messages regarding HWA, it is obvious that the level of interest and concern over HWA and the fate of our hemlock resources has risen significantly this past year. Indeed, 4 states were reported to have HWA infestations in 11 new counties in 1999 (see 1999 HWA Distribution Map on our website) and tree decline and mortality have been viewed as increasing throughout many areas of the generally infested region in the East.

This "surge" in the spread and impact of HWA is likely due to the mild winters we have experienced over the last three years, and the severe drought in 1999 that intensified the stress level on hemlocks. Mild winter-temperatures are favorable to HWA winter survival rates and hemlocks are considered to be very drought sensitive.

This is bad news for everyone and is particularly frustrating for researchers involved with field evaluations of HWA biological control candidates. The reproduction potential of predators normally lags behind that of its prey and it becomes a game of "catch-up" until predator numbers are sufficient to have an impact. With conditions so favorable for HWA and unfavorable for hemlocks, it is proving to be a difficult and extended challenge.

On a brighter note, a preliminary report by Dr. Mark McClure of the Connecticut Agricultural Experiment Station indicates that cold winter temperatures in January of 2000 have contributed to 90-95 percent HWA mortality in northern Connecticut. Sub-zero temperatures north of this region have reached below -5° F on several occasions and it appears to be taking its toll on HWA populations. Not to be sadistic, but I'm hoping this winter brings similar temperatures elsewhere!

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Stand, Landscape, and Ecosystem Level Responses to HWA Infestation in Southern New England Forests

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We continued to sample the permanent plots established in 1995 to examine mortality, microenvironmental changes, and seedling dynamics associated with HWA infestation. Since 1995, mortality of overstory and understory hemlock has risen to over 60 percent in half of the stands and continues to increase 5 to 15 percent a year. The health and vigor of remaining trees has deteriorated in all stands, with the majority of trees containing less than 25 percent of their foliage. We have observed no sign of tree recovery on these sites over the last four years.

Dave Orwig, Richard Cobb, and David Foster have continued their study in central Connecticut examining N availability, mineralization, and nitrification rates in a subset of Connecticut sites that are infested with HWA but have experienced little to no hemlock mortality. Closed-top soil cores are being examined for N analysis, pH, texture, and gravimetric soil moisture. In addition, ion exchange resin bags are being used *in situ* to monitor N availability and bags located out of plot will be examined for potential nitrate export. Soil temperature is being monitored at two depths at various locations within each site and hemispherical photographs will be used to calculate the degree of canopy openness and to create an index of light availability.

To complement the ongoing ecosystem study, R. Cobb et al. (unpublished data) have initiated a 2-year project examining the effect of HWA infestation on hemlock foliar decomposition rates. We predict that rates will increase with thinning hemlock canopies, although the magnitude of increase may, in turn, be mediated by foliar quality, which may be affected by HWA infestation. To elucidate these potentially interacting factors, hemlock foliage from eight infested stands in Connecticut and from non-infested forests at Harvard Forest in Petersham, MA will be examined for total C, N and C:N ratios and then analyzed *in situ* over time for relative decomposition rates.

We are currently writing up our landscape project that examined composition data from 114 mapped hemlock stands located within a 6000 km^2 transect that stretches from Long Island Sound to the Massachusetts border. Data includes hemlock mortality, degree of HWA infestation, average hemlock crown vigor, hardwood composition, humus depth, size and density of hemlocks and sapling and seedling information.

While sampling forests for the landscape-level study, we observed hemlock being cut on over 20 percent of the stands visited. These observations and others throughout Connecticut, Rhode Island and Massachusetts suggest that hemlock logging is increasing in frequency as a management option in infested stands. However, we do not know how cutting infested hemlock stands will affect regeneration composition or ecosystem processes. Newly initiated research by M. Kizlinski (unpublished data) is examining the effect of hemlock logging on re-vegetation and ecosystem processes that will complement ongoing research efforts in uncut stands and will shed insight on whether continued cutting will have any adverse impact on hemlock ecosystems.

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Measuring Impacts to Hemlocks Associated with HWA Using Landsat Imagery

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As part of our on-going effort to monitor hemlock decline over large areas using remotely sensed data, we acquired six leaf-off Landsat Thematic Mapper images for the northern New Jersey, southern New York, and eastern Pennsylvania region. The data span a 14-year period from 1984 (pre-HWA infestation) to 1998, with 2-year intervals from 1990 to 1998. Our previous work utilized two dates of Landsat Thematic Mapper imagery spanning ten years (before and after HWA infestation) to quantify current hemlock condition. Although successful, two dates did not reveal spatial or temporal patterns in the decline process, particularly the rate at which hemlocks were declining. Knowing the rate of decline is important for identifying site factors that explain the variation in the rate of decline from site to site as observed by many researchers. In a preliminary investigation in quantifying the rate of hemlock decline, we used a Vegetation Index (NDVI) and change-detection techniques (image differencing) to quantify the rate of decline for hemlock sites (30m x 30m pixels) within the NJ Highlands province. This year we will investigate the effect of site factors on the rate of decline, focusing on site characteristics that help control site moisture.

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Understanding Changes in Soil Composition and Stand Structure Following Hemlock Mortality From HWA

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"Hemlock Woolly Adelgid Impacts on Community Structure and N Cycling Rates in Eastern Hemlock Forests," by Jennifer C. Jenkins, John D. Aber, and Charles D. Canham (1999) was published in the Canadian Journal of Forest Research 29:630-645. We studied six formerly hemlock-dominated stands in Connecticut and Massachusetts, and found that light availability to the understory and seedling regeneration both increased in stands affected by the adelgid. Differences in soil organic matter, total C, and total N were not associated with hemlock decline. Inorganic N availability and nitrification increased at sites with hemlock mortality, suggesting that nitrate leaching is likely where the adelgid has induced tree mortality. In the longer term, ecosystem processes are likely to be driven by the successional dynamics that follow hemlock mortality.

Speaking of successional dynamics, a study entitled "Predicting Long-term Forest Development Following Hemlock Mortality," by Jenkins, Canham, and Barten was presented at the Hemlock Symposium at the University of New Hampshire in June 1999, and will be published in the Proceedings from that meeting. In this modeling study, we found that light availability was the most important predictor of successional dynamics following hemlock mortality. If a hemlock stand experienced complete mortality, for example, forest succession began with early-successional species. If hemlock mortality was incomplete, mid to late-successional species took over.

In addition, collaboration has been initiated between Richard Hallett and Jennifer Pontius, USDA Forest Service Northeastern Research Station, Durham, NH, and Richard Evans, Delaware Water Gap National Recreation Area, to investigate the relationships between adelgid infestation, hemlock mortality, and cation abundance. Data have been collected, but no samples have been analyzed to date.

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Influences of Hemlock Mortality on Soil Water Chemistry

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We have been studying the effects of hemlock mortality on soil water chemistry since 1996. In October 1996, we began monthly sampling and chemical analysis of soil water in four healthy eastern hemlock stands in the Catskill Mountains of southeastern New York. In July 1997, hemlock trees in two of the stands were girdled (i.e. bark and cambium severed around the base of the bole) to simulate mortality due to the hemlock woolly adelgid. We observed elevated nitrate and cation (ammonium, aluminum, calcium, magnesium) concentrations in soil water from girdled stands in the fall of 1997 and the summer and fall of both 1998 and 1999.

We attribute these increases in nutrient loss to fine root mortality, decomposition, mineralization processes, and reduced nutrient uptake by vegetation. Our data demonstrate that hemlock mortality can lead to significant nutrient losses to soil water. A summary of this research will be included in the proceedings from the Symposium on Sustainable Management of Hemlock Ecosystems in Eastern North America (see "Influences of eastern hemlock mortality on nutrient cycling" by Yorks, T.E., J.C. Jenkins, D.J. Leopold, D.J. Raynal, and D.A. Orwig).

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Propagule Banks of Hemlock Stands in the Catskill Mountains

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We examined aboveground vegetation and vascular plant propagule (seeds and spores) banks of six hemlock stands in the Catskill Mountains. Our objectives were to determine the densities and species composition of the propagule banks and use these data to predict early stand development if hemlocks are killed by the adelgid. We found abundant yellow birch seeds, evergreen woodfern spores, and hay-scented fern spores in the propagule banks of all stands. Our results indicated potential stand replacement by evergreen woodfern and, eventually, yellow birch in the event of hemlock mortality. However, hay-scented fern could become abundant if woody species are over-browsed by white-tailed deer. See Yorks, T.E., D.J. Leopold, and D. J. Raynal. 2000. "Vascular Plant Propagule Banks of Six Eastern Hemlock Stands in the Catskill Mountains of New York." Journal of the Torrey Botanical Society 127: In press.

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Continuing Hemlock Ecology Studies and Evaluating Management Options for HWA at the Delaware Water Gap National Recreation Area

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HWA infestations have spread throughout the 70,000 acres of Delaware Water Gap National Recreation Area (DEWA) during the past several years. HWA was first detected in DEWA during the winter of 1988-89. In the spring of 1995, and again in 1999, HWA surveys were conducted throughout DEWA, using GPS to document locations. In 1995 HWA was present at about 50 percent of the sites, but by 1999 HWA had spread to 95 percent of the sites. Hemlock defoliation and mortality is now apparent at a number of these infested sites. The National Park Service (NPS) is preparing an Environmental Assessment to evaluate alternatives for preventing the decline of hemlock. Alternatives being considered include (1) no action; (2) selective treatments with oil or soap sprays, or systemic insecticides; and (3) biological control options including the release of *Pseudoscymnus tsugae*. We invite general and technical comments or concerns regarding any of these alternatives (contact Rich Evans).

The USGS Biological Resources Division (BRD), in cooperation with the NPS, developed a landscape-based sampling design in 1997 to assess biodiversity losses that could result from eastern hemlock decline at DEWA (John Young et al.). Fourteen pairs of hemlock and hardwood stands and streams with similar topography (slope, aspect, elevation, terrain shape, light exposure, and stream size) were selected as sites for ecological studies. In 1998 the BRD (Craig Snyder et al.) completed studies of stream temperatures, insects, and fish at these sites. Since March 1999, staff at the DEWA have collected monthly stream samples at all these sites for chemical analysis, including nitrogen and major cations, by SUNY College of Environmental Science & Forestry (Thad Yorks et al.). During the 1999 drought, hemlock streams maintained flows whereas many hardwood streams did not. In 2000, the Wildlife Conservation Society (John Behler), in cooperation with the NPS, will initiate surveys of amphibians, and the BRD (Bob Ross) will initiate surveys of bird communities at these 14 pairs of hemlock and hardwood sites.

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Capturing Baseline Information on Hemlock-based Vegetative Communities In Advance of Hemlock Woolly Adelgid

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In 1998, Larissa Knebel and Aaron Cooper, (graduate students from Western Carolina University under the guidance of Dr. Dan Pittillo), began a project with eastern hemlock in the North Carolina side of the Great Smoky Mountains National Park. The objective was to resample 20 plots containing significant amounts of eastern hemlock established by Frank Miller during the 1930's. Hemlock woolly adelgid is not yet found in the park and this research provided baseline information on hemlock resources. The sampling protocol of 20m by 50m plot size was the Peet, Wentworth and White (1998) standard now being applied throughout the southern Appalachian region by many investigators. An additional 26 plots were also selected to better sample the varied stands of hemlocks at different elevations. The goals of this project were to record changes in the vegetation since the Miller sample and to predict the probable community change should hemlock mortality occur as a result of the adelgid.

From late 1998 through the 1999 field season, Forestry Technicians from the Great Smoky Mountains Vegetation Management Division accompanied Dr. Pittillo and his staff and collected additional data: mature hemlocks were evaluated in each plot for crown health conditions using the U.S. Forest Service Forest Health Monitoring Crown Condition Rating protocol. Plots were located and documented using the Global Positioning System. Analysis of this information through combined efforts of all parties involved should be available soon. Both M.S. theses were completed in December 1999.

In the future, the National Park Service resource managers hope to conduct a similar hemlock-sampling project on the Tennessee side of the park in order to have a complete database for hemlocks in the Great Smoky Mountains National Park. This information will be invaluable should the hemlock woolly adelgid eliminate or severely damage our hemlock forests and change the forest infrastructure in the future.

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HWA Status at Shenandoah National Park

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Suppression: Hemlock woolly adelgid continues to plague Shenandoah National Park's eastern hemlock population. Suppression for 1999 began in May using M-PEDE insecticidal soap and continued through much of the summer since many trees continued adding new growth. Spray operations were suspended in August due to drought stress since the pesticide leaf coating might add to tree stress. Spraying was resumed and completed in October. A total of 128.6 acres consisting of 1,708 trees were sprayed.

Year 2000 suppression operations will begin in the end of March or early April. Water will be hydrosprayed to physically reduce adelgids in several areas near aquatic ecosystems where pesticides are prohibited. We will continue normal spray operations using M-PEDE, spraying all areas at least two times. Heavily infested locations will be sprayed more as deemed necessary by monitoring. At least two new areas will be added including Judd Garden, in an effort to protect its cultural resources, and an area near Skyline Drive in Central District for colony genetic preservation. A total of 250 acres is anticipated.

Survey: Hemlock crown health sampling began with data collection at six Long Term Ecological Monitoring sites (LTEMS) and continued with the SNP random crown health surveys. The latter was revised to enhance statistical outputs. Much credit is due Dave Morton, John Young and two top-notch statisticians of the Leetown Science Center (USGS-BRD) for their support in this improvement. One hundred truly random 15-meter radius plots were located at sites within known hemlock concentrations. This sample was determined to be adequate in discerning yearly changes in hemlock crown health within a ten percent confidence level. Although we now use crown health ratings in ten percentile increments, the former (three live and two dead) categories are noted for ongoing analysis of data sets collected in previous years. The new detailed site data sheet includes slope percent, position and shape, landform, aspect, elevation, and distance categories from streams, trails and roads. This information will be used in statistical analysis to determine if these factors are significant in relation to crown health. More sites may be added after the hemlock-mapping project is completed to get an accurate idea of the Park-wide status of hemlock crown health. To date, one third of the sites have been visited. The remainder will be completed in early 2000. All sites will be revisited from October through December 2000.

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HWA Physiology

HWA Diapause

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In the first of two experiments in 1999, we were able to prevent the induction of diapause in sistens by preconditioning progrediens from the egg to 2nd instar lifestages. A manuscript is currently being prepared for publication of our diapause data dating back to 1997.

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HWA Progredien Development Rate Model

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We have quantified the effect of constant temperatures, ranging from 4 to 32°C, on the development of HWA progrediens. Development occurred from 4 - 22°C and we produced a degree-day and non-linear model for second instar to adult lifestages. Too much variability occurred in trying to predict the duration of first instars, and therefore was left out of the analysis. The low temperature development threshold was estimated to be 3.8°C and the high threshold is between 22 and 27°C. Both models were tested with field-collected data and estimates were off by ca. 20 – 25 percent. A manuscript is being prepared for publication.

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Sampling for HWA

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We will be following up our earlier work on developing a simplified field sampling procedure for HWA. This is a cooperative project with the USFS and the National Park Service. It has been demonstrated that there is a strong correlation between presence-absence and overall density of HWA. Attempts to develop a sampling procedure around this have thus far eluded us, mainly because of the changing nature of HWA infestations through time. Therefore, we will attempt to normalize this relationship among sites by finding key tree and site measures that may serve as a covariant to the changing status of the infestations.

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Biological Control of HWA

Evaluation of *Laricobius nigrinus* as a Potential Candidate for Biocontrol of HWA

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Collaborator: Lee Humble
Canadian Forestry Service

Laricobius nigrinus continues to be evaluated as a biological control agent of HWA. With support from the USFS and in cooperation with the Canadian Forestry Service, sampling for HWA and *L. nigrinus* has taken place since September 1998 in British Columbia. Sampling will continue in 2000 and data collected thus far show that the life cycle of the predator is highly synchronous with its prey. The predator feeds principally on progrediens eggs as adults and larvae. The adult goes into aestival diapause at the same time as the sistens. Sampling will continue for one more year.

There has been some success in rearing, where 800 F1 generation predators were produced from ca. 300 parents and 150 larvae imported this past spring. The process is very labor intensive and needs to be streamlined.

Oviposition tests demonstrate that HWA is preferred over other adelgid species. Larger scale oviposition and feeding studies are planned for 2000.

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Do HWA Predators Use Olfaction to Find Their Prey?

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In the spring of 2000, we will be getting an electroantennogram detector to link to our gas chromatograph. This will allow us to investigate whether the host-specific predators imported into the eastern U.S. use olfaction to search for and find their HWA prey. The analytical work will be accompanied by behavioral studies. If olfaction proves to be one of the cues used by predators, the volatiles identified could be used to help augment natural enemy releases and may serve as a sampling tool for predator presence and density.

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Initial Field Evaluation of Lady Beetles from China

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The lady beetle *Scymnus* (*Neopullus*) *sinuanodulus* Yu et Yao imported from China was field evaluated in 1999. The experiment consisted of three treatments: (1) unbagged branch, (2) bagged branch without the lady beetles, and (3) bagged branches with a single, previously mated female. The bagging was done in mid-April when sisten generation eggs had mostly been laid. Each treatment had 9 to 20 replicates and there was an average of 450 adelgid ovisacs containing 22,000 eggs on the 0.3 m branch of each replicate. The experiment was evaluated one month later when mostly progredien nymphs were present. There were 50 percent more nymphs in the empty bags than on branches with no bags, indicating a strong bag effect. Bags with beetles that produced progeny had 60 percent fewer adelgid nymphs compared to empty bags. One month later, when a census of the sisten generation was taken, there was no statistical difference between any of the treatments although the adelgids were 20 percent lower in bags with beetle larvae compared to empty bags. The initial adelgid population was too high in this experiment; <10% of the branch tips produced new growth and populations in controls declined three-fold from one generation to the next. Next year, we plan to repeat this test placing the beetles in the field before April and caging a larger branch area with a lower density of adelgids. We also will begin field evaluation of another species, *Scymnus* (*Neopullus*) *ningshanensis* Yu et Yao, from a more northern area of China.

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Evaluating *Pseudoscymnus tsugae* Sasaji and McClure as a Biological Control Agent for Hemlock Woolly Adelgid, *Adelges tsugae* Annand.

Mark S. McClure and Carole A. S-J. Cheah
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Drs. Mark McClure and Carole Cheah, assisted by Beth Beebe, Mary Klepacki, and Steven Lamoureux, continued studies in 1999 in Connecticut to evaluate the efficacy of *Pseudoscymnus tsugae* as a biological control agent for hemlock woolly adelgid. Nearly 70,000 adults of *Pseudoscymnus tsugae* were reared in Windsor during 1999; 54,226 of these were released at 8 new sites in Connecticut, 6,115 were released at 3 previous release sites in Connecticut to augment populations there, and 4,850 were sent to Dr. Tim Tigner of the Virginia Department of Forestry to augment a previous release site in Virginia and to continue field experiments on the control of Balsam woolly adelgid. More than 100,000 beetles have now been released at 16 sites throughout Connecticut. Our evaluation of these sites, which were intentionally selected in parts of the state with different histories of infestation, suggested that *P. tsugae* has the greatest potential efficacy in newly infested forests where adelgid densities are low and trees are generally healthy.

At the Bloomfield and New Hartford sites, where 10,000+ adults of *P. tsugae* were released starting in spring, 1996, beetles were abundant in the lower crowns of trees in September, 1998. In Bloomfield, 60 adults were collected in 4 people hours of sampling, and in New Hartford, 77 adults and 7 larvae were collected in 2 people hours of sampling.

At each of three new sites in Connecticut where 10,000 beetles were released in spring, 1999, *P. tsugae* was collected during the following several months on release trees and nearby ones. In July, 10.1 adults and 1.4 larvae were collected on average every 43 minutes; 13.6 adults were collected on average every 37 minutes in August, and 0.3 adults were collected on average every 31 minutes in October. No larvae were collected after July. Despite the presence of *P. tsugae* at these sites, hemlocks have generally declined due to severe drought in 1999 and a string of relatively mild winters which encouraged the survival and proliferation of hemlock woolly adelgid and another exotic pest, the elongate hemlock scale, *Fiorinia externa*. In addition to the goals of the multi-state cooperative release project, these sites are providing information on how patterns of initial beetle release influence efficacy.

Additional laboratory investigations on the possible effects of *P. tsugae* on non-target species confirm that beetles strongly prefer to feed on hemlock woolly adelgid, but that they will attack some aphid species when adelgids are unavailable. Further impact evaluations of *P. tsugae* on aphids and other non-target species are planned for next season.

Field studies have revealed that *Harmonia axyridis* and green lacewings are abundant throughout the year at some of our beetle release sites, especially those that have been infested for several years and where adelgid densities are very high. We are currently investigating interactions among these predators and consequential effects on biological control.

Field experiments have been initiated to determine the efficacy of different imidacloprid treatments on hemlock woolly adelgid and potential impacts on *P. tsugae*. Three-year studies on short-term impact of *P. tsugae* on populations of hemlock woolly adelgid have been completed and manuscripts are currently in press in Biological Invasions and in the Proceedings of the Symposium on Sustainable management of Hemlock Ecosystems in Eastern North America, UDSA Forest Service.

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Pseudoscymnus tsugae: 1999 Mass Rearing and Release Activities in New Jersey

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The rearing of the hemlock woolly adelgid predator *Pseudoscymnus tsugae* continues to progress well. A total of 140,000 beetles were produced in 1999 with 65,000 released in 13 sites in NJ and an additional 67,500 shipped to other states under the USDA Forest Service cooperative agreement. The remaining beetles were held as rearing stock. Overall, the New Jersey Department of Agriculture has produced 230,000 beetles to date with a total of 140,500 released in NJ between 1998 and 1999.

P. tsugae adults were recovered during the year of the release at all of the 1999 sites while *P. tsugae* adults were recovered at 7 of the 15 1998 release sites. Recoveries have not been made yet from the 1998 release sites that had less than 4,500 beetles released in them.

P. tsugae adults were recovered 50 m from the release tree at Allamuchy State Park, one of the sites where 10,000 adult beetles were released. Adult beetles were recovered at all of the 1999 release sites, usually within five minutes of surveying.

At four of the 1998 release sites, HWA populations were noticeably lower than the previous year but likely due to drought stress and previously heavy HWA populations rather than *P. tsugae*. In the permanent plots where we have been monitoring HWA populations and hemlock tree health since 1988, drought related stress is also apparent even though little additional tree mortality occurred in 1999.

In 2000, the goal is to increase the production of *P. tsugae* above our 1999 production. Beetles will be released at 10-15 new sites in NJ and provided to other cooperating states for establishment purposes.

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Multi-State Release and Stand Level Evaluation of *Pseudoscymnus tsugae*

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In 1999, the USDA Forest Service coordinated a multi-state effort to establish and evaluate the HWA predator beetle *Pseudoscmnus tsugae* in HWA infested areas throughout the east. The purpose of this evaluation is to determine this predator's effectiveness at protecting hemlock forests and to monitor its movement throughout the stand. Beetles were reared at the NJ Department of Agriculture Beneficial Insect Laboratory under a cooperative agreement with the USDA Forest Service. The 10 states involved with this evaluation include: CT, RI, MA, NY, NJ, PA, MD, WV, VA and NC. Release areas were selected and will be monitored by state forest health specialists using a sampling protocol provided by the Connecticut Agricultural Experiment Station and the USDA Forest Service. Primary measurements in this evaluation include: number and life stages of recovered *P. tsugae* beetles; changes in HWA population densities; and changes in crown condition as a measure of tree health. The duration of this evaluation is expected to be at least 3 years.

In 2000, the USDA Forest Service has again entered into a cooperative agreement with the NJ Department of Agriculture to provide limited quantities of *P. tsugae* for purposes of establishing the beetles in other infested states. All releases will be coordinated with respective state cooperators who will be identifying the release sites. Because this predator is only available in limited quantities and is still being evaluated, beetles are not yet available to the general public.

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Ode to the Hemlocks of the Great Smoky Mountains

Marion Kloster
Great Smokey Mountains National Park

They tower like giants,
above the forest floor,
as high as some mountains,
where red-tails soar.

If only they could talk,
the stories we'd hear,
of generations gone by,
the changing of seasons through the years.

They murmur with the wind,
as it rustles their boughs,
they crack and creak,
in a more forceful attempt to speak.

Take notice! Look at me!
they seem to say,
I'm the oldest of a great species,
please take the time to glance my way.

Is it God's plan for the adelgid to destroy these beauties?
Is it time for Mother Nature's cycle to complete her duties?

Or will their strength see them through,
to weather their toughest storm,
will they still be here,
when our great-grandchildren are born?

What is the answer?
no one knows their fate,
so for now,
take the time to walk amongst them,
enjoy, appreciate.

HWA Related Publications

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