

**HEMLOCK WOOLLY ADELGID FACILITY APPROVAL**

For shipping *Tsuga* spp, *Picea jezoensis* and *Picea polita* to all provinces Canada (except British Columbia) under the requirements of Canadian Food Inspection Agency Policy Directive D-07-05 concerning phytosanitary measures to prevent the introduction of Hemlock Woolly Adelgid (*Adelges tsugae* Annand) into Canada.

**Name of Facility:** \_\_\_\_\_

**Manager:** \_\_\_\_\_

**Mailing Address:** \_\_\_\_\_

Physical Address: \_\_\_\_\_

**E-mail address:** \_\_\_\_\_

**Telephone No.:** \_\_\_\_\_ **Fax No.** \_\_\_\_\_

**Conditions for Exporting Under the Approved Program for Hemlock Woolly Adelgid (*Adelges tsugae* Annand)**

Shippers of Hemlock Woolly Adelgid (HWA) host material to Canada must meet the requirements of CFIA Directive D-07-05 and follow the attached protocol to be considered an eligible facility for exporting to Canada.

I, \_\_\_\_\_(printed name) , the owner/person in possession, care, or control of the above named facility have read and understood all the conditions and obligations stated herein by which I may export nursery stock in accordance with CFIA requirements and the attached protocol.

Further, I am and shall be responsible for and shall attach no liability to the United States Department of Agriculture or to any officer or representative of the Department, from and against all manners of actions, causes of action, claims, demands, loss, costs, damages, actions or other proceedings by whomsoever made, sustained, brought or prosecuted in any manner based upon, caused by, arising out of, attributable to or with respect to any failure, inadvertent or otherwise, by act or omission, to fully comply with the said conditions and requirements.

Dated \_\_\_\_\_, \_\_\_\_\_ at \_\_\_\_\_, State of \_\_\_\_\_

\_\_\_\_\_  
Applicant's Signature

**Approved Facility under the HWA Protocol**

\_\_\_\_\_  
Regional Program Manager, APHIS

\_\_\_\_\_  
Date

\_\_\_\_\_  
APHIS PPQ State Plant Health Director

\_\_\_\_\_  
Date

\_\_\_\_\_  
Representative, Oregon Dept. of Agriculture

\_\_\_\_\_  
Date

# Requirements for Approving Facilities to Export Hemlock Woolly Adelgid Host Material Nursery Stock to Canada

## Background

### Biology:

The Hemlock Woolly Adelgid (HWA) has a complex life cycle. In North America there are three life generations per year: **Sistens**, which overwinter, **progreddiens** which remain on hemlock, and **sexuparae** which migrate to spruce. In May-June, "winged" sexuparae and the "wingless" progrediens develop simultaneously. In June, the **sexuparae** females fly to a spruce host on which they lay eggs. These "unfertilized" eggs hatch into sexuales which, in North America, fail to develop successfully regardless of the spruce species used as a host. The "wingless" female **progreddiens** oviposit on hemlock. The eggs hatch in June and July. The newly hatched first instar nymphs are often called "crawlers" because they crawl around the plant as they look for a place to feed. These first instar nymphs will eventually attach themselves at the base of needles where they will feed briefly before becoming inactive. This period of inactivity will last until mid-October at which time feeding will resume and the nymphs will mature during the autumn and winter. The nymphs will slowly develop a waxy overcoat as they mature into the final adult stage. This **sisten** generation matures into adults in February after four nymphal instar stages. From March to May, the **sistens** each produce a single ovisac containing up to 300 eggs which will develop into **sexuparae** and **progreddiens** adults four weeks after the eggs hatch. The number of eggs that become **sexuparae** increases with adelgid density. This response could be due to declining host nutrition. Weather conditions between October and March can hasten or delay the development of the sistens generation by as much as two weeks. In Connecticut and Virginia there are significant overlaps of all the HWA life stages, especially during late spring when 12 life stages can be recorded on the same day (nymphs, adults of both progrediens and sexuparae and sisten eggs).

### Hosts:

Yeddo spruce (*Picea jezoensis hondoensis* (Mayr) Rehd.), tiger-tail spruce (*Picea polita* (S. & Z.) Carr.), eastern hemlock (*Tsuga canadensis* (L.) Carrière), Carolina hemlock (*Tsuga caroliniana* Engelm.), Chinese hemlock (*Tsuga chinensis* (Franch.) Pritz.), Japanese hemlock (*Tsuga diversifolia* (Maxim.) M.T. Mast), western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), mountain hemlock (*Tsuga mertensiana* (Bong.) Carr.), southern Japanese hemlock (*Tsuga sieboldii* Carr.) and Himalayan hemlock (*Tsuga dumosa* (D. Don) Eichler).

### Distribution:

**North America:** Canada (British Columbia), United States (Alaska, California, Connecticut, Delaware, District of Columbia, Georgia, Kentucky, Maine, Michigan, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, Washington, West Virginia).

**REQUIREMENTS FOR APPROVING FACILITIES TO SHIP REGULATED HWA HOST MATERIAL OF NURSERY STOCK TO CANADA (except to the Province of British Columbia):**

Each facility must demonstrate that they meet the requirements as specified below:

**Training:** All propagation, production and shipping staff must be trained to visually identify HWA; including recognition of damage and symptoms caused by HWA. Information on the detection and identification of HWA may be found on page 5 of this document.

**Pest Management Program:** The facility must have a pest management program in place that includes: inspection of incoming HWA host material; scouting of HWA host material during the production process; a treatment program which specifically targets HWA; a process to notify USDA/APHIS and the State or County Department of Agriculture of any detections of HWA; and inspection of HWA host material for export.. The manager of the facility (or designated responsible party) must demonstrate to the satisfaction of USDA/APHIS that the pest management program is in compliance with HWA protocol before the facility will be approved.

**1. Inspection of Incoming HWA Host Material:**

All incoming HWA host material must be free of HWA. All incoming HWA host material must be held and inspected for all stages of HWA prior to entering the production area.

**2. Production Process:** The manager must describe in detail the management practices and inspections which will be conducted at various locations/stages of the production process.

**3. Scouting Program:** The facility must have a system in place which includes the scouting of HWA host material at the nursery on a biweekly basis. The nursery must keep records of the results of the scouting and these scouting reports will be provided to USDA/APHIS and the State or County Department of Agriculture upon request.

In the event of a detection of HWA, or a suspect detection of HWA, a sample of the pest will be submitted as soon as possible to the State or County Department of Agriculture for identification.

**4. Treatment Program:** The facility must employ a treatment program that specifically targets HWA. They may utilize a documented integrated pest management system approach and documentation must be provided to USDA/APHIS upon request. A list of approved chemicals is provided in Appendix 9 of Canadian Directive D 97-05. If the facility intends to use a product which is not listed in the Directive, the facility must provide label information to USDA /APHIS, who will submit it for approval by CFIA.

**Treatment prior to shipping:** Plant material must be treated with a pesticide within 2 days of shipment during the high risk period (March 1 to June 30) and within 7 days of shipment during the low risk period (July 1 to February 28 (or 29). The pesticide application must reflect one of the treatment options described in Appendix 9 of Canadian Directive D 97-05.

**5. HWA detection:** The facility must immediately notify USDA/ APHIS and the State or County Department of Agriculture of any finds of HWA within their operation or on plants obtained from their source of supply.

The facility will be temporarily removed from the program until corrective actions are taken to the satisfaction of USDA/APHIS.

**6. Export Inspection:** All export shipments of HWA host plants (except plants in vitro) must be inspected according to the following processes:

a. Outgoing Plant Material (except plants in vitro):

Facility staff will inspect all outgoing HWA host material destined to Canada at the staging/shipping area.

HWA Host material will be inspected according to the “Inspection and Sampling Procedures” table below. Any detection of live HWA will negate the shipment of this material.

**Inspection and Sampling Procedures**

Lot Size*	Sample Size
500 or less	10%*
501 - 800	75
801 - 1,300	110
1,301 - 3,200	150
3,201 - 8,000	225
8,001 - 22,000	300
22,001 - 110,000	450
110,001 - 555,000	750
555,001 and over	1500

\*For lot sizes of 500 or less, the sample size is determined by taking a 10% sample of the total lot.

b. Outgoing Materials Plants *in Vitro*:

Plants *in vitro* must be propagated in a sterile medium under sterile conditions and produced in closed transparent container.

Plants *in vitro* must be shipped in their closed or sealed aseptic transparent containers.

c. Phytosanitary Certification:

The phytosanitary certificate for shipments HWA host material must contain the following Additional Declaration: “The material was produced by an approved grower and is free of HWA”.

d. Notification to CFIA:

USDA/ APHIS will provide CFIA with a list of all growers approved under this program.

USDA/ APHIS will notify CFIA within 5 working days of the discovery of HWA at the approved facility. The facility will be temporarily removed from the program until corrective actions are taken to the satisfaction of the USDA.

## **HWA Detection and Identification**

### **Symptoms**

White "woolly" sacs can be seen at the base of needles, particularly on the younger growth, throughout the year but are most abundant in the spring. The "woolly" appearance is due to a fluffy wax coating that covers the body of the adults. Dieback of twigs and discoloration of the foliage is the result of nymph feeding. Preference is given for maturing trees on stressful sites. The first attacks often occur on the lower branches.

During the first year that follows the initial colonization of a hemlock stand, HWA populations expand rapidly reaching a peak density. The second year, there is a considerable decline in the HWA populations because trees fail to generate new growth which is the preferred food of the adelgids. The following year, when some new shoots appear, the number of adelgids rises again but the fourth year, when most trees die, only non-viable sexuparae are produced. Thus, the population dynamics of HWA vary according to density-dependent factors.

### **Identification**

**Egg:** Oblong and amber in color. Eggs which develop into sistens are approximately 0.36 mm long and 0.23 mm wide, those which produce progrediens and sexuparae measure around 0.35 mm in length and 0.21 mm in width. Eggs from which sexuales emerge measure 0.37 mm long by 0.25 mm wide. They are produced by the sexuparae adults which deposit up to 15 eggs beneath their folded wings. Eggs of adult sisten are laid in a single batch of up to 300 in a spherical "woolly" ovisac made of white wax threads. Progrediens adults also lay their eggs (up to 250) in similar but smaller cottony ovisacs.

**Nymph: Sistens and Progrediens:** Very similar in size and appearance. Crawlers (first-instars) are about 0.44 mm long and 0.27 mm wide, brownish-orange in color. Second-instars measure around 0.57 mm in length and 0.34 mm in width. Legs are short and thick. Third-instars are approximately 0.67 mm long by 0.43 mm wide, and fourth-instars 0.74 mm by 0.47 mm. **Sexuparae:** First-instars similar in appearance to those of the sistens and progrediens. Second-instars measure about 0.60 mm in length and 0.35 mm in width whereas third-instars are approximately 0.77 mm long by 0.47 mm wide and fourth-instars, 0.89 mm by 0.49 mm.

**Adult: Sistens:** About 1.41 mm long by 1.05 mm wide. Possess a heavy waxy-coat. **Progrediens:** Approximately 0.87 mm in length and 0.63 mm in width. **Sexuparae:** Measure around 1.09 mm by 0.51 mm. Dark brown in color with long (five-segmented) antennae, compound eyes and four textured wings.

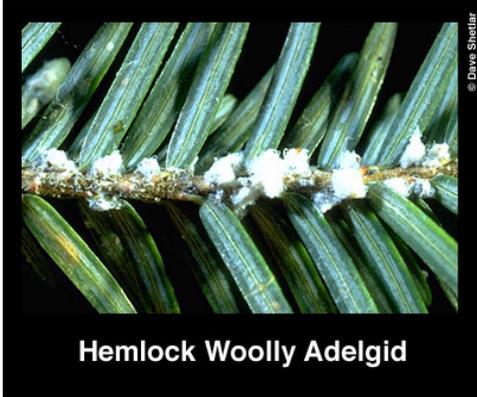


Fig. 1



Fig. 2



Fig. 3



Fig. 4

Text: Plant Pest Surveillance Unit.  
Photos: USDA, Forest Service, Hamden, CT, USA