Technical report on Eastern Filbert Blight in hazelnut orchards from BC

Prepared for BC Ministry of Agriculture

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1.0 Introduction

The objective of this document is to outline the appropriate methods for the removal and disposal of hazelnut trees infected with Eastern filbert blight (EFB) in British Columbia. Both large scale and small scale EFB infestations will be considered, with different options provided regarding clearing and disposal in each case. Additional information is provided regarding the management options for EFB infections within orchards with less serious infestations and the disposal of infected trees which do not require large scale removal.

The first section of this document reviews the disease origins, spread, and pathology to help familiarize growers with the threat posed by EFB. The second section provides information for growers on different management techniques to prevent infection at a young age. These methods are designed to prevent the need for large scale tree removal and include pre-emptive pruning, fungicide application, and the introduction of disease resistant cultivars. Finally, a review of disposal options for larger scale infestations is given, including burning/incineration, chipping/composting, or contractor excavation/removal and disposal. However, no single option may be generally applicable and it is left to the grower to decide the most appropriate treatment option for their particular situation. Hence, the ultimate goal of this report is to provide growers with general information regarding EFB control and the treatment options available for developing a management plan that accommodates their individual needs.

Information provided in this report is based on a literature review of the most current practices being used in Western North America. This includes research from the Pscheidt Research Group of Oregon State University, archived resources from the BC Ministry of Agriculture, professional guidance from the BC Hazelnut Growers Association, and publicly available research communications from Nature Tech Nursery. Current BC industry practices are based on interviews with the BC Hazelnut Growers Association.

2.0 Background Information

2.1 Origin and impact of Eastern filbert blight in British Colombia

Eastern filbert blight (EFB) is a phytopathogenic disease that targets hazelnut trees and is caused by the fungus *Anisogramma anomala*. Infections can spread rapidly and contribute to an overall decline in orchard health and productivity. Widespread infestation has become common since 1985 within the Pacific Northwestern United States and since 2001 in southern areas of British Columbia. Mitigation of the spread of EFB is essential in protecting these crops and strategic management of infected populations must be carried out to ensure the future productivity of the hazelnut farming in British Columbia.

2.2 Current State of Hazelnut Orchards in British Columbia

The infiltration of EFB infestations originating in Oregon and Washington state from the mid 70’s and 80’s were identified in BC by 2001. Currently, the disease has spread and impacted every commercial orchard within the lower mainland despite quarantine measures restricting importation of hazelnut trees into BC from any region known to contain EFB. Many EFB-impacted orchards in BC have since been
ravaged by the disease, leaving unproductive or dead trees at whole orchard scales. The resulting loss of viable crop has left many orchards dead or abandoned, though some farmers have begun to take measures to clear previously infected plots and replant in an effort to renew local hazelnut production in the future. While many of these replanting efforts have taken advantage of the development of disease resistant cultivars (see section 1.7), full disease resistance is not guaranteed and further management options including strategic pruning (section 1.5) and fungicide treatment (section 1.6) are considered vital in combating EFB infestation.

### 2.3 Lifecycle of Eastern Filbert Blight

Figure 1 depicts the general lifecycle of EFB infection and growth on hazelnut trees. Hazelnut trees are susceptible to infection during early spring, when bud break occurs. Spores of the fungus target newly formed stem tissue and then enter a latent period of 12-15 months before the infected shoot begins to show the characteristic canker symptoms of EFB. Following a cold dormant period, the infected trees produce dark brown structures called stroma within the mature cankers, which release spores in the spring (Figure 2). The spores are actively discharged during rainy periods, dispersed via splash droplets, and propagated by air currents onto fresh stem tissues. Without intervention, the perennial expansion of cankers lengthwise on branches will continue in infected tissues, eventually resulting in dieback of branches as the cankers girdle the limb of the tree. While the fungus does not survive within dry dead tissue, it can continue to release spores after the removal of infected branches if the tissue remains moist through spring.
Figure 1: Lifecycle of Eastern Filbert Blight (Figure adapted from: Oregon State University Eastern Filbert Blight Help Page; http://oregonstate.edu/dept/botany/epp/EFB/).

The diagram in Figure 3 depicts the general lifecycle of a single EFB infection in the context of the typical hazelnut tree growing season and a generalized schedule for treatment measures designed to mitigate further spread of the disease. Management options and timing of disposal for severely infected trees are addressed in detail below (Sections 3 & 4). Briefly, aggressive scouting is essential in the management of the disease and should be carried out as an ongoing process throughout the growing season. Pruning and removal of infected tissues should be limited to periods outside of bud break in the spring when new growth is most susceptible to infection. Finally, any infected wood must be removed or treated (i.e. composted or burned) before bud break in the spring. The schedule here should be considered as a guideline only and growers may need to alter this plan to suit their particular interest.

Figure 2: Images of EFB infected hazelnut tissue: a) Immature EFB stromata that have erupted through the bark in early summer, b) Rows of mature black stromata running along the length of branches are a characteristic symptom of Eastern filbert blight disease (photo courtesy of Joseph O’Brien, USDA Forest Service, http://bugwood.org) , c) Close-up image of fungal stromata of Eastern filbert blight., and d) Black stroma beginning to develop the second summer after infection (Photos courtesy of: Jay W. Pscheidt, Department of Botany and Plant Pathology, OSU, and Joseph O’Brien, USDA Forest Service, http://bugwood.org),
**Figure 3**: Example plan schedule for Eastern filbert blight (EFB) treatment and mitigation. Red outlined text indicates EFB lifecycle; black outlined text indicates suggested treatment schedule.
3.0 Management Strategies

3.1 Scouting, Pruning, and Dehorning

Good management of hazelnut orchards will minimize the spread of EFB in situations where orchard productivity is still viable. These measures include scouting for EFB infected tissues, pruning of EFB infected limbs (Figure 5), and in more extreme cases the dehorning (removal of large stems/branches to reduce tree height) of EFB infected trees.

With the continued spread of EFB in hazelnut orchards of British Columbia, all orchards must employ intensive scouting to detect infected trees as early as possible. Scouting should be performed twice a year: once from spring to early summer to identify any cankers or spore-containing stroma and once in late summer to identify any dying branches (dieback). These are typically found near the upper region of the tree canopy. Employment of a “cherry picker” is recommended to ensure optimal viewing when scouting for diseased limbs and better access to the infected areas during pruning.

Pruning of any diseased branches should be performed approximately 2-3 feet below any visible cankers on the diseased limb. The diseased tissues can be burned. Alternatively, they can be chipped and allowed to compost. All pruning must be performed before bud break in the spring or in summer/fall/winter when young growth has matured sufficiently to prevent propagation of airborne spores into juvenile tissues.

Dehorning involves removal of the entire tree canopy at a height of 5-6 feet from the ground. This procedure should only be considered in the case of more extreme infections. The advantages of this technique include the removal of both the visibly infected tissue and infected tissue in the latent phase not yet showing cankers. However, disadvantages are numerous and include a high risk of injury to the tree, large open cuts in the tree tissue, which may be susceptible to further infection, loss of productivity, and generation of large amounts of waste material.

Figure 4: Example of removal of infected wood (photo credit: Ken Johnson, 1990).
3.2 Fungicide application

Fungicide application is essential in minimizing the spread of new EFB infections. Growers should follow a regular fungicide spraying program for their orchards regardless of the cultivar grown to prevent new infections and disease development. Four applications are typically recommended, starting just after bud break in the spring when trees are highly susceptible to new infections. Sequential applications should take place in 10-14 day intervals and must cover all new growth to be effective.

Typical fungicides used for EFB fall into 4 groups based on their mode of action (Group 3, 11, M1, and M5). To prevent fungicide resistance, each application should alternate types of fungicides with different modes of action. For example, if the first application utilizes a Group M5 fungicide (i.e. chlorothalonil) then the subsequent application may employ a copper-based Group M1 fungicide (i.e. copper oxychloide). Concentrations of each fungicide application would be determined based on disease pressure with higher concentrations used with more severe infestations. Volumes of fungicide used will be dependent on the tree canopy size with mature orchards receiving the larger recommended volume. The following fungicides are registered for the treatment of EFB in Canada:

Table 1
Fungicides used for treatment of Eastern Filbert Blight

<table>
<thead>
<tr>
<th>Fungicide</th>
<th>Application Rate</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bravo 500 (chlorothalonil 500 g/L)</td>
<td>2.7 L/acre in 200-1200 L water/acre</td>
<td>Apply during bud break and shoot elongation. Do not enter treated area within 3 days of application. Do not apply within 120 days of harvest.</td>
</tr>
<tr>
<td>Copper oxychloride 50</td>
<td>1.2-3.6 kg/acre in 400 L water/acre</td>
<td>Apply at 7-10 day intervals. Do not apply within 1 day of harvest.</td>
</tr>
<tr>
<td>Cueva (10% copper octanoate)</td>
<td>0.5-2.0% solution in 500-900 L water/acre</td>
<td>Apply at 7-10 day intervals. Do not apply within 1 day of harvest.</td>
</tr>
<tr>
<td>Flint 50 WG (50% trifloxystrobin)</td>
<td>56-112 g/acre in &gt;400 L water/acre</td>
<td>Higher rate when disease pressure is severe. Do not apply in excess of 4x/season. Do not apply within 60 days of harvest.</td>
</tr>
<tr>
<td>Quadris Flowable (azoxystrobin)</td>
<td>250 g/L in 360 L water/acre</td>
<td>For mature trees use at least 400 L/acre. Do not apply within 45 days of harvest.</td>
</tr>
</tbody>
</table>
3.3 Disease resistant cultivars

Recent progress in mitigating the spread of EFB involves the use of disease resistant cultivars when planting new trees. EFB resistant cultivars have been developed for the Pacific Northwest region based on the genetic disposition of EFB strains. The EFB resistant cultivars are numerous and varied in their effectiveness against infection and may be available from various nurseries via the Oregon State University breeding program. Currently, many of the disease resistant cultivars are not readily available within Canada. However, six have been approved and included within the BC Hazelnut Growers Association trials designed to explore the viability of these cultivars for use within the local market. The six cultivars include three high yielding main crop cultivars (Jefferson, Sacajawea, and Yamhill) as well as three main pollinizers (Eta, Gamma, and Theta).

With replanting efforts it is highly recommended that growers utilize these cultivars in the effort to manage and mitigate further EFB infection. Since young trees are not yet fully resistant to EFB and may also be more susceptible to diseases other than EFB, it is highly recommended that orchardists planting new cultivars adopt a fungicide spraying program based on recommendations outlined in Section 3.2. For information, availability, and pricing of disease resistant cultivars, growers are directed to Nature Tech Nursery Ltd. (https://www.naturetechnursery.com) where comprehensive efforts have been made to introduce these varieties into BC.

3.4 Tree removal

Larger infestations involving the death of whole trees will require full tree removal and disposal. Small scale incidences of infestation involving only a few trees may be manageable using the methods such as burning or chipping and composting. Large scale infestations involving the majority of trees found in the orchard will require more aggressive measures, such as large scale burning requiring the assistance of specialists and heavy equipment. As with pruning, the handling of diseased tissues and whole trees must be avoided during spring when juvenile tissues are highly susceptible to EFB infection. A detailed summary of these methods is given in the section below.

4.0 Disposal Guidelines

4.1 Preparation

It is important to consider all disposal options before commencing the orchard removal process. Two primary concerns are the disposal of surface materials (i.e. support wire, irrigation tubing, sprinklers PVC pipe, tree bands and treated wood posts) and the disposal of wood waste from the infected trees.

4.2 Removal and safe disposal of surface materials

Surface materials include support wire, irrigation tubing, sprinklers, PVC pipe, tree bands and treated wood posts. They are illegal to burn due to the toxic chemicals they release into the atmosphere. These materials must first be removed from the orchard and then separated for disposal or reuse.

Support wire, metal clips, and plastic ties should be reused if possible or recycled. Lengths of wire should be rolled for easy transport, storage, or recycling. If material cannot be reused, it must be disposed of at a local landfill where it can be recycled, or a local metal salvager capable of processing the waste. Posts or trees with embedded metal wire must be separated during excavation and cannot be burned or
chipped. Legislation in British Columbia strictly prohibits the burning of metal wire or wood posts treated with preservatives.

Plastics such as irrigation tubing, sprinkler heads, PVC pipe, and tree bands must be prepared for recycling or disposal if reuse is not feasible. Sprinkler heads and all metal clamps and fittings should be removed. Tubing should then be cut into manageable segments and sealed in heavy plastic bags that won’t tear. If no recycling exists in the local region, growers must dispose of these materials as garbage. PVC pipe must be separated from tree wood material and disposed of in garbage if it cannot be reused. Never burn plastic materials and do not mix different types (i.e. poly irrigation tubing and PVC piping).

Treated wood posts should not be mixed with tree wood as the treated posts contain toxic chemicals such as arsenic. They cannot be legally or safely burned and should not be chipped or composted. These materials must be removed before removing trees and must be separated from all tree wood. Reuse treated wood posts if possible or contact other local growers and offer the material for reuse. Otherwise, treated wood posts should be disposed of at a local landfill.

![Figure 5: Examples of surface materials common to orchard farming (left to right: support wire, irrigation materials, support posts).](image)

4.3 Tree removal

Tree removal is normally carried out by excavation of the trees and stumps followed by disposal via chipping and composting or burning. The most common method of disposal is burning as it is the most effective in the destruction of infected wood.\(^1\) Composting can be difficult for growers due to management inputs and variables (temperature, carbon/nitrogen ratio, moisture content and storage). A summary of potential removal options is given in Table 2 below and each option discussed in further detail throughout this section. For detailed information regarding composting, growers are directed to the BC Agricultural Composting Handbook ([http://www.rdosmaps.bc.ca/min_bylaws/ES/solid_waste/BCAgCompostHandbook1998.pdf](http://www.rdosmaps.bc.ca/min_bylaws/ES/solid_waste/BCAgCompostHandbook1998.pdf)).

Table 2

<table>
<thead>
<tr>
<th>Summary of disposal options for EFB infected hazelnut trees</th>
</tr>
</thead>
</table>

\(^1\) McTavish discussions with BCHGA December 2017
<table>
<thead>
<tr>
<th>Disposal Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chipping/Composting</td>
<td>• Requires little additional resources</td>
<td>• Destruction of diseased tissue takes time</td>
<td>Heckert et al. 2014, 2016; Pscheidt and Cluskey, 2006; BC Agricultural Composting Handbook, 1998</td>
</tr>
<tr>
<td></td>
<td>• Inexpensive</td>
<td>• Requires close management of compost to prevent disease spreading</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Destruction of diseased tissue takes time</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Requires close management of compost to prevent disease spreading</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Environmetally harmful carbon emissions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Controlled burns may require permits and close management</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Environmental harmful carbon emissions</td>
<td></td>
</tr>
<tr>
<td>Open Burning</td>
<td>• Destruction of diseased tissue</td>
<td>• Environmentally harmful carbon emissions</td>
<td>Pscheidt 1989, 1999; BC OBSCR; BC Agricultural Waste Disposal – Best Practices Guide</td>
</tr>
<tr>
<td></td>
<td>• Inexpensive</td>
<td>• Controlled burns may require permits and close management</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Environmentally harmful carbon emissions</td>
<td></td>
</tr>
<tr>
<td>Tree excavation/removal</td>
<td>• Diseased tissues removed from property</td>
<td>• Potentially cost prohibitive</td>
<td>BC Agricultural Waste Disposal – Best Practices Guide; BCHGA communications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Potential damage to existing orchard infrastructure</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Environmentally harmful carbon emissions</td>
<td></td>
</tr>
<tr>
<td>Incineration</td>
<td>• Efficient destruction of diseased tissue</td>
<td>• Cost prohibitive</td>
<td>BC Agricultural Waste Disposal – Best Practices Guide; BCHGA communications</td>
</tr>
<tr>
<td></td>
<td>• Low carbon emissions</td>
<td>• Unreasonable for smaller scale infestation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Environmentally harmful carbon emissions</td>
<td></td>
</tr>
</tbody>
</table>

4.3.1 Excavation
Before disposal work begins, plans should be discussed with a commercial contractor. Following removal of surface material as described above, wood should be separated according to whether it can be:

a) salvaged,
b) chipped for compost,
c) burned

Proper planning should involve discussing with the contractor how they want the wood to be prepared before excavation. For example, some companies prefer that the wood to be salvaged is separated prior to tree excavation and wood to be chipped is correctly placed prior to processing.
The excavator should remove as much dirt and rock debris from the roots as possible to avoid topsoil loss and prevent interference during chipping or burning. If trees are being hauled to a landfill instead of processed on site, then the trees should be cut into segments acceptable to local landfill authorities.

Following excavation, it is best practice to refill the holes immediately, set aside any further surface materials which may be uncovered during excavation, and clean machinery to prevent potential cross contamination of EFB spores. All tree removal should be performed prior to bud break in the spring or well after growing seasons in the late fall and winter. This prevents propagation of any spores from intact stroma.

4.3.2 Wood salvaging

While there are several salvaging methods available, a plan should be established for each part of the tree (i.e. branches, trunk, and stump). Ensure that equipment has proper access to the property. Small branches are typically removed and piled in each orchard row to prepare for disposal via a portable chipper or mulcher. Stumps may be hauled to local landfills or ground with branches using a tub grinder. Contact local authorities for information and requirements if hauling material to local landfill. Unless the existing trees are dead and dry prior to excavation, the salvaged wood must be covered to prevent the spreading spores from viable stroma still existing on EFB infected branches until wood is fully dried.

4.3.3 Wood chipping and composting

Wood chipping and composting is a more environmentally friendly alternative to managing tree waste than burning. However, intact EFB stroma can remain viable sources of spores in wet plant tissues for a period following removal. It is therefore vital that EFB infected tree waste be chipped or mulched to fragments no larger than 1-2 inches long and the material composted until the complete destruction of the fungus is achieved. This state of decomposition will be attained when the EFB stromata are no longer physically observable within the composting pile.

Figure 6: Gathering and chipping of wood waste using portable wood chipping machinery.
Chipping of larger scale or whole-orchard infestations may require the deployment of flail mower machinery. The height and diameter of the dead trees will determine the suitability of this method, with larger trees usually requiring individual excavation. While typical non-diseased wood chips may be used for a variety of applications, it is again recommended that EFB infected tree waste be burned, composted, or removed from the site of operations to prevent any further spread of infection.

In the case of composting, the material should be covered (i.e. plastic or tarpaulin draped over compost pile), to prevent potential spread of intact spores from the pile via air currents. However, compost must be aerated to prevent anaerobic conditions and create a stable compost. Moreover, wood chips alone may not be sufficient feed stock to promote optimal composting conditions and additives may be required. Growers are again directed to the BC Agricultural Composting Handbook for detailed information on proper composting techniques. Composting management is essential for successful decomposition of the tree waste.

The compost process is dependent on many factors including carbon-to-nitrogen ratio (C:N), surface area and particle size, aeration, porosity, moisture content, temperature, pH, nutrient availability, and the presence of toxic substances. Wood chips in particular exhibit high C:N (200-500:1) and require amendments to a more ideal composting range approaching 30:1, as the higher C:N will limit decomposition and slow the composting process. Temperature presents another key factor for composting of wood chips. A range between 32 and 60 °C is ideal for microbial decomposition of feedstock. Higher temperatures result in reduced microbial activity, so compost should be monitored frequently. Additionally, the microbial communities needed for healthy compost production are aerobic strains which require oxygen for metabolizing the stock material. Thus, aeration must be maintained throughout the compost cycle to facilitate the growth of these microbes. Moisture content also must be considered and adjusted to a range of 40-60%. Compost piles should mature at least 18 months before being uncovered, to ensure the death of any stroma that may be still intact following chipping.

For further detailed information on agricultural composting, growers are directed to the BC Ministry of Agriculture and Food Composting Factsheet available for download at: http://www.rdosmaps.bc.ca/min_bylaws/es/solid_waste/bcagcomposthandbook1998.pdf

4.3.4 Open burning of wood waste

While open burning of agricultural crop residues (i.e. orchard prunings) typically does not require a permit, larger forms of wood waste are not considered to be agricultural crop residues if burned. The subject property must therefore follow the Open Burning Smoke Control Regulation and associated Code of Practice. The Open Burning Smoke Control Regulation states that the burning of woody debris may only be permitted when the local forecast Ventilation Index is sufficient to disperse the resultant smoke. In particular, the Index must read as GOOD (55-100) the day of burning and at least FAIR to GOOD (34-100) for the following day. Up to date Ventilation Indices can be viewed on the BC government webpages (http://www.env.gov.bc.ca/epd/epdpa/venting).

In the case of larger orchards with EFB infestations, open burning may be the most viable and cost-effective disposal method. In such cases, best burning management practices should be followed and burn duration and smoke production should be minimized. Both municipal and provincial governments regulate open burning. Before carrying out any burning operation, check for:
- restrictions imposed by local government bylaws
- regulatory restrictions under the Environmental Management Act
- fire safety concerns regulated by the Ministry of Forests under the Forests and Range Practices Act

Local fire departments, municipalities, improvement districts or regional districts may have specific bylaws or restrictions on open burning. **Where local requirements are more stringent, they apply over provincial legislation.** There are specific standards and exemptions under the *Environmental Management Act* and associated *Open Burning Smoke Control Regulation* for various materials burned on the farm (see Section 6). A waste discharge approval or permit for burns is **not** required under this Act for:

- agricultural burning of crops, weeds, foliage, or stubble,
  - Foliage includes regular pruning,
  - Foliage does not include tree stumps, root balls, whole trees, or large branches.
- Burns that satisfy all the terms and conditions set out in the *Open Burning Smoke Control Regulation* and the *Open Burning Smoke Control Code of Practice*

Particulate emissions and pollution can be reduced by implementing the following practices to reduce smoke production:

- Increasing fire intensity via auxiliary fans
- Minimizing the duration of the smouldering stage, as this phase can contribute more than half of the total particulate matter emitted during the burn
- Controlling the type of fuel used
- Ensuring that no contaminants are introduced to the pile
- Avoiding compaction of materials
- Allowing wood to fully dry before burning
- Controlling the duration of burns
- Avoiding combustion when smoke is unlikely to disperse properly such as during periods of calm stable air or when the venting index is poor
- Avoiding overloading fire piles as this may restrict combustion and cause excessive smouldering and smoke generation
- Ensuring that fire attendees have equipment and water on hand appropriate to the type and size of fire
- Following information as outlined in the wildfire act and wildfire regulation

Local municipalities may invoke more restrictive legislation when practicing open burning and hence it is strongly advised that growers contact local authorities regarding any bylaws that must be followed.

### 4.3.5 Incineration via curtain burners

In the case of dead, abandoned and/or large-scale infestations, eradication of the disease may require burning of large amounts of tree wood. The removal/disposal of large amounts trees by burning likely exceeds any municipal bylaw standards for pollution. A viable solution is the utilization of curtain
burners. Curtain burners are portable incinerators which can be used on site for the disposal of large amounts of wood waste. Advantages include reduced emissions and smoke impact to local municipalities, communities, and wild life. In addition, incineration via curtain burners eliminates the need to haul large amounts of wood waste from infected orchards, as in the case of wood chipping. Most air-burning units are fully portable, allowing machinery to be placed beside waste material and reducing costs.

The contained air burner units also reduce fire risk in extreme burning conditions that may be unsafe for conventional open burning practices. For large scale EFB infestations, a curtain burner unit is useful because it ensures that all infected tissues will be eliminated from the property in a timely manner. One setback of this method is the cost prohibitive nature of dealing with large scale infections. Cost analysis for each circumstance of EFB infection will dictate the viability of disposal in this context.

Contacting local bylaw authorities and commercial contractors is recommended prior to planning incineration. This ensures best management practice for this method of waste disposal.

Figure 3: Small scale portable incinerator (Photo courtesy of: AirBurners, Inc.)

5.0 Legislation and relevant acts

5.1 Municipal Bylaws
Growers choosing to employ burning methods for the treatment and disposal of EFB infected hazelnut trees will require municipal permits before conducting any open burning activity. Municipalities or regional districts may have a fire bylaw that covers open burning. Local governments often have a ‘burn ban’ at certain times of the year for fire safety reasons. Growers must check with the local government office or fire department to find out about municipality guidelines for information regarding burning permit applications and seasonal burning schedules. A permit may be required and a special permit for diseased material may be given during restricted times in extreme circumstances.

5.2 Canadian Food Inspection Agency

Plant Protection Policy Directive D-00-03: Import requirements from the United States and domestic movement requirements for material to prevent the introduction of Eastern filbert blight into British Columbia.
In accordance with federal efforts to limit the spread of EFB infestations, movement of plants for planting to or from any infested areas of the US and Canada is strictly prohibited. Movement within infested areas of Canada is not regulated.

5.3 Burning Considerations

5.3.1 Environmental Management Act (EMA)

Under the EMA, all prescribed activities require government authorization prior to the discharge of emissions or waste into the environment. Of primary concern with open burning events are the release of contaminants that can impact air and health quality, toxic emissions from waste materials such as plastics, and odors related to burning. In the context of EFB management, activities related to open burning include the burning or incineration of vegetative debris and wood waste. The Ministry of Environment (MOE) requires that nearly all burning activities obtain site specific permission under the EMA. Requests for formal permissions must be acquired through the MOE and include technical justification for the burn. The permit or approval application process can be found on the government website (https://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/routine-application-process).

Exemptions under the EMA include burning of leaves, foliage, weeds, crops, and stubble for agricultural purposes if not prohibited by local bylaws. This may apply to routine pruning’s of hazelnut orchards if EFB infections are less severe. However, extreme EFB infestations requiring large-scale removal of wood and debris may not fall under this exemption and may be subject to the Open Burning Smoke Control Regulation. Prunings that are done in large quantities are still exempt under EMA and do not need to follow OBSCR. But large branches, whole trees, land clearing, roots, and root balls are not exempt and fall under the rules of OBSCR. Furthermore, open burning piles larger than 3 meters in diameter and 2 meters tall fall under Category 3 designation wherein acquisition of a Burn Registration Number from the Ministry of Forests, Lands and Natural Resource Operations is required (Contact: 1-888-797-1717) and follow requirements set forth by the Wildfire Act and Regulations.

Open Burning Smoke Control Regulation (OBSCR)

All burning that is not exempt from EMA falls under the requirements of the OBSCR. Burning can only take place when the ventilation requirements and setback distances of the regulation are met. The following burning requirements are designated for Category A areas (mainly urban areas, including all cities, towns and villages, and those districts in the Capital, Central Okanagan, Fraser Valley, Greater Vancouver, Okanagan-Similkameen, and Sechelt regional districts) and apply within most BC municipalities:

- The smoke-release period for each parcel of land must not be greater than 72 consecutive hours
- Open burning of debris may proceed if no open burning has occurred on the parcel of land at any time during the 15 days preceding the open burning
• Smoke may be released during open burning on a parcel of land on no more than four separate occasions during a calendar year

In Category B areas, including mainly rural locations and any areas of the province not designated Category A, the smoke release period of fires may be up to 96 hours.

The following restrictions presently apply to open burning, (it should be noted that the BC Government has published a document with intended changes to these regulations):

Existing regulation (December 2017) state that burning cannot take place within:

(a) 100 metres from neighbouring residences and businesses
(b) 500 metres from schools in session, hospitals and facilities used for continuing care as defined under the Continuing Care Act

Additional considerations include:

• Care must be taken so smoke from open burning does not pose a hazard at airports or on provincial highways by significantly reducing visibility
• Open burning of debris must not be initiated if the local air flow will cause the smoke to have a negative impact on a nearby population or cause pollution
• Unless otherwise exempted for smoke management purposes by a burning permit or in a burn plan approved by the Ministry of Forests, open burning of debris must not be initiated if atmospheric mixing at the site where the debris is to be burned is insufficient to provide rapid dispersion of the smoke

The new open burning regulations intend to make the following changes with respect to burning of diseased plant material. “Setback distances for burning will be increased to 500 meters from residences or businesses and 1,000 meters (1 km) from schools, hospitals and care facilities. Setback distances will be reduced to 50 meters in specific situations – community wildfire protection or management of diseased vegetative debris. Burning within the specified setback distances under these situations will need to follow best management practices set out in the regulation”

Growers are referred to the BC Ministry of Environment factsheet regarding provincial burning requirements for more information (https://www2.gov.bc.ca/assets/gov/environment/waste-management/garbage/fs_burning_req.pdf). A burning protocol flowsheet is provided below to help growers determine the appropriate legislative measures necessary to their situation.

2 http://www.env.gov.bc.ca/epd/codes/open_burning/pdf/obscr_information_update_2016_06.pdf
Before you light a fire to burn debris, ensure you have REDUCED, REUSED and RECYCLED as much of the material as possible.

Are you planning on burning prohibited Material?

Yes

Is there a local *Burn Ban* in your area?

Yes

Follow the burning Bylaw and if called for Open Burning Smoke Control Regulation

Do you plan on burning debris from agricultural development?

Yes

Examples:
- Squirting up land
- Expanding cropping area
- Removal or cleaning up ditch lines

No

Are there any local, regional district, or other bylaws for burning in your area?

Yes

No

Do you plan on burning for pest or disease control?

Yes

No

Are you planning on burning only the following debris?

- Leaves
- Crops
- Stubble
- "Foliage" – the vegetation removed in the maintenance of cropped plants
- Weeds

You DO NOT need to contact the BC Ministry of Environment

Follow Open Burning Smoke Control Regulation

Note: Before Burning you must ensure that the forecast venting conditions are appropriate for smoke dispersal, and appropriate set-back distances are met.
5.3.2 Farm Practices Protection (Right to Farm) Act (FPPA)

Farm practice protection involves the creation of fair and balanced processes to consider concerns about nuisances associated with farm operations. Local governments, First Nations, ministry staff and industry peer advisors continue to participate in efforts to resolve concerns.

The protection provided by the FPPA specifically relates to nuisances such as odour, noise, dust or other disturbances. The right to farm is, however, not automatic. It requires that:

- A farm operation use “normal farm practices” (as defined by the FPPA) or practices as may be prescribed by Cabinet regulation
- The operation does not contravene other legislation or any land use regulation

When a farm operation follows these requirements, the farmer is not liable to any person and cannot be prevented by an injunction or court order from any nuisance related to the operation of the farm. For farm operations in the ALR, the FPPA means that farmers cannot be charged with violations of local government bylaws related to animal control, noise or nuisance falling under provisions stated within the Community Charter (section 260 – bylaw contraventions) and the Local Government Act (Section 416 – bylaw contraventions, offenses and persecutions).

The applicability of a burning bylaw to a farm in relation to the FPPA depends on the authority under which the bylaw was prepared (as a ‘fire’ bylaw, or a ‘nuisance’ bylaw to control smoke), and where the farm is located (inside the ALR and other lands, or not). Therefore, the FPPA protects farmers from complaints for smoke if they are following or exempt from the applicable regulations. A farmer is also exempt from a local bylaw if that bylaw is created for nuisance purposes. With respect to EFB and orchard/tree removal, the most common complaint from neighbours is likely to be related to smoke from the burning of dead trees.

6.0 Cost considerations

The decision to choose a higher cost alternative sometimes comes down to timing and urgency. For instance, if there is a burn ban then chipping/composting is necessary. Chipping of whole orchards is not logistical most of the time so growers may choose to hire an air curtain burner to incinerate infected trees. The following provides general cost (budget) areas that growers should consider prior to disposal. Actual costs will vary depending on contractors, area of the province, and amount of work carried out by the orchard owner.

- Scouting/Pruning
- Fungicide application
- Single tree removal ($35-75/tree)
- Open burning
- Incinerator burning
- Flail mowing
- Chipping/Composting

It is recommended that a budget be developed prior to tree removal. An example of some of the cost categories to consider when removing trees and burning is provided in Table 3.
### Table 3
Example of tree removal and burning budget

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours/days</th>
<th>Cost (per hour or day)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavator for tree/stump removal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tractor with loader</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trailer (for wood hauling to disposal area)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dozer for land levelling and filling tree holes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour for pruning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour for tree falling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour to assist in tree removal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour for fire management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour for clean up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 7.0 Tree Removal Contractors

Based on industry interviews, the most common approach to finding a suitable contractor for tree removal is the use of local contractors/farmers with appropriate machinery available, such as large excavators. It is recommended that growers research local contractors and seek multiple quotes. Certification is not required for tree removal and/or disposal when using heavy equipment such as excavators. Professional contractors from the Fraser Valley, Okanagan, and Vancouver Island regions can be found through internet searches. The following criteria should be followed when hiring a contractor:

- Work Safe BC clearance letter
- Appropriate business license for the region
- Felling of larger trees by chainsaw may require falling and bucking certification
- Appropriate company Health, Safety, and Environmental program

It is highly recommended that growers find a reputable local excavation contractor with experience in tree removal and disposal. Growers are encouraged to contact the BC Hazelnut Growers Association with inquiries about tree removal and disposal ([https://www.bchga.com/contact-us](https://www.bchga.com/contact-us)).
8.0 **Summary/Conclusions**

BC’s hazelnut industry has been in decline since 2005, mostly due to EFB. In addition, many orchardists are at or near retirement. Therefore, the measures necessary to control the disease may not seem viable. However, with approximately 90% of the hazelnut supply in Canada being imported primarily from the United States and Turkey, potential for long term stability exists for the hazelnut industry within Canada. The profitability of this crop hinges on growers’ ability to proactively manage EFB infection and the replanting of viable orchards. Among other fruit tree varieties, hazelnut trees offer an advantage in that commercial harvests may be realized within only 5 years of planting, with full yields between 10 and 12 years. Comprehensive management planning with attention to EFB control presents a potentially high value/low input crop with sustained long-term profitability within the local Canadian market.

9.0 **References**


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