



Upper Midwest
Hazelnut
Development Initiative

2022
Insect Management Guide for
Hybrid Hazelnuts

Insect Management Guide for Hybrid Hazelnuts 2022 (Version 1)

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This guide lists the biologies, lifecycles, and recommendations for insects and mite control in hybrid hazelnut orchards. This information is based on research and the observations of Upper Midwest Hazelnut Development Initiative (UMHDI) researchers. Effective pest management depends on growers and their knowledge of the orchard and its characteristics. Information on hazel plant establishment, fertilization, and harvesting can be found on the UMHDI's website: <https://www.midwesthazelnuts.org/publications.html>.

UMHDI does not endorse any chemical products or intends to discriminate against any products not mentioned. Consult product labels to determine whether their use confers advantages to protecting your crop and always refer to pesticide labels for safety and use instructions. Apply pesticides judiciously, be aware of pollinator and bee foraging times, and promote good relationship with neighbors.

Please be aware of regulations governing the application of pesticides outline in the EPA Worker Protection Standard, particularly the Application Exclusion Zone, which is enforced by the Minnesota Department of Agriculture in Minnesota and the Department of Agriculture Trade and Consumer Protection in Wisconsin. See Minnesota standards at <https://www.mda.state.mn.us/worker-protection-standard> and Wisconsin standards at https://datcp.wi.gov/Pages/Programs_Services/WorkerProtection.aspx. Pesticide labels provide re-entry intervals and safety information.

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For a digital copy of this guide see the UMHDI's publication page (link above). For printed copies contact Jason Fischbach at jason.fischbach@wisc.edu.

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Hazelnut weevil (*Curculio obtusus*)

The hazelnut weevil is a native weevil species that is naturally associated with the American hazel and eastern beaked hazel. Unfortunately for us, they also infest hybrid hazelnuts. Adults are about 0.3 inches in length, brown in color, and have a long snout.

Life cycle

Adults emerge from the soil and begin mating in the hazel plants starting in mid to late-May. **Females lay eggs into developing hazelnuts from early/mid-June through mid-July.** The larvae then feed on the developing hazelnut kernel until it is full grown. Once fully grown, the larvae chew holes through the nutshell, exit the nuts, drop to the soil and burrow underground to overwinter. Larvae pupate in the soil the following spring before emerging as adults.



Current Status

The hazelnut weevil is expected to be a large problem for hybrid hazelnut growers in the Upper Midwest. In two of our experimental plantings near the Twin Cities, we saw 25% crop loss from the weevil in 2020 and 28% in 2021.

Management

Control measures are currently being studied and developed for the hazelnut weevil. There is a similar species in Europe (*Curculio nucum*), which has an economic threshold of 2-3 weevils per plant and is treated with pyrethroids every two weeks as needed. **Currently no pesticides are labeled for control of the hazelnut weevil in the United States.** Researchers with the UMHDI are evaluating plant resistance, sanitation techniques, plastic ground coverings, and the use of poultry for hazelnut weevil control. You can scout for hazelnut weevil in your orchard via beat-sheet sampling: using a dowel or other large stick, shake or beat the plant ~10 times over a canvas or tarp and look for any adult weevils that fall out (pictured below).



Photos: 1) mature larva inside hazelnut; 2) adult weevil; 3) example of beat-sheet sampling. Stick is held by person to right and is not visible. All photos by Hailey Shanovich.

Hazel stem borer (*Agrilus pseudocoryli*)

The hazel stem borer is a native jewel beetle (aka flat borers or buprestids). This insect is naturally associated with the American hazel and eastern beaked hazel. Recently, the insects have been identified infesting hybrid hazelnuts in the Midwest. Adults are reddish purple in color and are about a quarter inch in length.

Life cycle and damage

Adults emerge from hazel stems starting in early June and leave characteristic D-shaped exit holes on branches (see photo). The adults form small mating swarms in small sections within hazelnut orchards. Adults can be observed flying and mating from early-June to late-June. Females will then lay eggs into bark of the hazel stems. Larvae develop inside the cambium of the wood and feed in a circular manner around the internal circumference of the stems, cutting off nutrient transport. **The stem begins to swell around the feeding activity (see photo) and eventually the whole branch may die back.**

Current status

We are unsure how large of a problem hazel stem borers will be for the Midwest hybrid hazelnut industry. Anecdotally, these beetles seem to become a problem once hazel plants are more mature. We just started having problems with them in our experimental plantings in Minnesota in the last few years: one planting is 13 years old and the other is 10 years old as of 2021. They seem to favor more mature plants with greater stem diameters over young plants. We suspect that **drought conditions may exacerbate branch dieback from the beetles.** Additionally, we have found that they favor plants that are susceptible to eastern filbert blight (EFB).

Management

Currently there are no management recommendations for the hazel stem borer and no insecticides labeled for use. Coppicing plants after 10 years may help to control the pest due to their preferences for more mature plants with greater stem diameters. Additionally, continued development of EFB-resistant hazel plants may help to control stem borers given their preference for susceptible varieties.



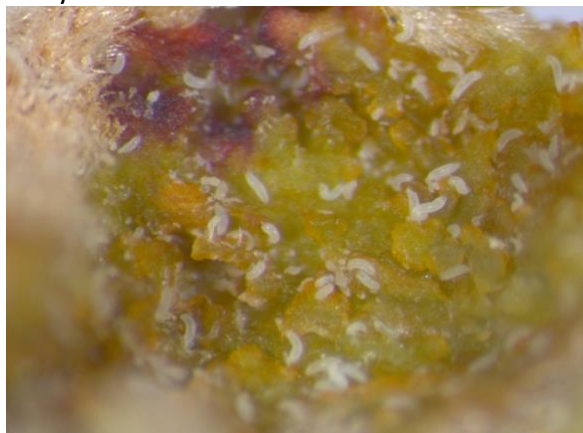
Photos: 1) swelling and D-shaped exit hole on stem (Hailey Shanovich), 2) adult hazel stem-borer (Pheylan Anderson, University of Minnesota)

Hazelnut big bud mite (*Phytoptus avellanae*)

The hazelnut big bud mite (BBM) is an introduced eriophyid mite species that can infest cultivated hazel plants and hybrids. The adults and immatures are microscopic and so not seeable to the naked eye. Their feeding causes hazel vegetative and floral buds to swell into galls (AKA **big buds**) that usually fail to develop. Therefore, they can directly reduce hazelnut yields and reduce the amount of leaves on a plant.

Life cycle

Immature mites, called nymphs, begin leaving big buds in spring (about mid to late-May) to migrate to newly formed buds on the hazel plants. This migration to new buds by the nymphs can last for up to 90 days, **but in Minnesota we have found the migration is usually from mid/late-May through early/mid-July. This is migration period is the only time of year when the mites are susceptible to a chemical spray for control.** Otherwise, the rest of their lifecycle is spent safe inside the plants’ buds. Once inside new buds, the nymphs will molt to adults and begin feeding and mating from fall and winter until the following spring. Newly formed “big buds” are usually visible in the fall, especially after leaves have fallen off the plants, on most varieties of hybrid hazels.



Photos: 1) Deformed tissue inside a hazel bud from big bud mite feeding, 2) Big buds compared to normal sized hazel buds in March. All photos by Hailey Shanovich.

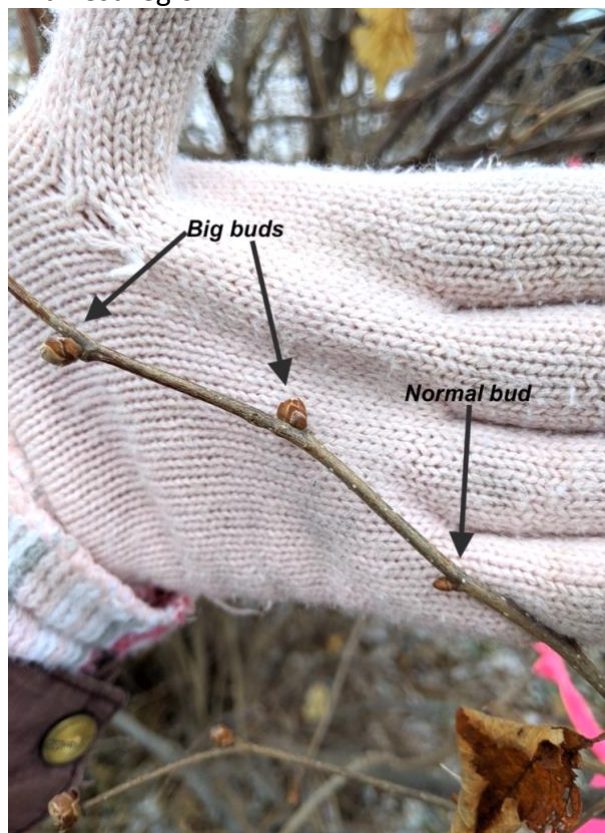
Current Status

The hazelnut big bud mite is expected to pose a moderate threat to hybrid hazelnut production. However, only hybrid hazel varieties that are susceptible to BBM are at risk. There has been a lot of success in breeding for BBM in European hazel varieties in Oregon. Midwestern hazelnut breeders are working to integrate this resistance into the hybrid varieties.

Management

There are 8 different pesticides registered for use in the US against BBM in hazelnut. For full details, see the [Oregon State University 2022 IPM handbook](#).

Note that the suggested calendar dates will be off: the mites migrate from mid-May through early-July in the Upper Midwest, not March-April like it states in the Oregon handbook. Researchers at the UMN are developing a degree day model for accurate prediction of mite migration for the Midwest region.



Japanese beetle (*Popillia japonica*)

The Japanese beetle (JB) is a species of scarab beetle that was introduced to the US. It feeds on turfgrass roots as larvae and on the foliage, flowers and fruit of many major ornamental and agricultural crops as adults. **JB adults can feed on the leaves of hazel plants, leaving a characteristic “skeletonized” or “lacey” appearance.**

Life cycle

In the Midwest, JB adults begin emerging from the soil in mid to late-June. After emerging, adults typically have a lifespan of 4-6 weeks, during which they are mating, feeding, and laying eggs. Female beetles continuously land on the ground to lay eggs throughout the summer; they prefer sites non-sandy soil and short grass or turfgrass for egg-laying. The larvae then hatch and begin feeding on grass roots and then overwinter deeper in the soil. The following spring larvae continue feeding on grass roots and emerge as adults once mature. Adult JB can feed on more than 300 plant species and can form large aggregations.

Current Status

Japanese beetles are generally not a concern for hazelnut production in the Midwest. Large aggregations of beetles are alarming, but often do not defoliate enough leaf tissue to severely impact the plants’ photosynthesis and vitality. **They are of the greatest concern on young plants or recently coppiced plants, which don’t yet have large nutrient reserves yet.** Adult JB and their feeding are very easy to recognize and scout visually.

Management

Currently no commercial insecticides are labeled for use against JB in hazelnut in the US. However, Neem tree extracts (i.e., azadirachtin) have been found to be effective at repelling JB and reducing defoliation when applied to foliage of other crops. It is not recommended to treat fields or adjacent

areas for JB grubs as the adults are highly mobile and can fly in from elsewhere. option for preventing any aboveground insect feeding, although expensive. Researchers at the UMN are working to develop more JB recommendations for hybrid hazelnuts.



Photos: 1) Japanese beetles feeding on hazelnut leaf (Hailey Shanovich), 2) Hazel plant severely defoliated by Japanese beetles (Giovanni Bosio, Settore Fitosanitario - Regione Piemonte)

Stink bugs

The nymphs and adults of many species of native stink bugs in the Midwest can feed on hazelnuts and hazel plant stems as both nymphs and adults. The brown marmorated stink bug (BMSB) is a species that was introduced to the US that also has the potential to be a pest of hazelnuts.



Photo: brown marmorated stink bug and eggs on a bean leaf (Hailey Shanovich)

Life cycle

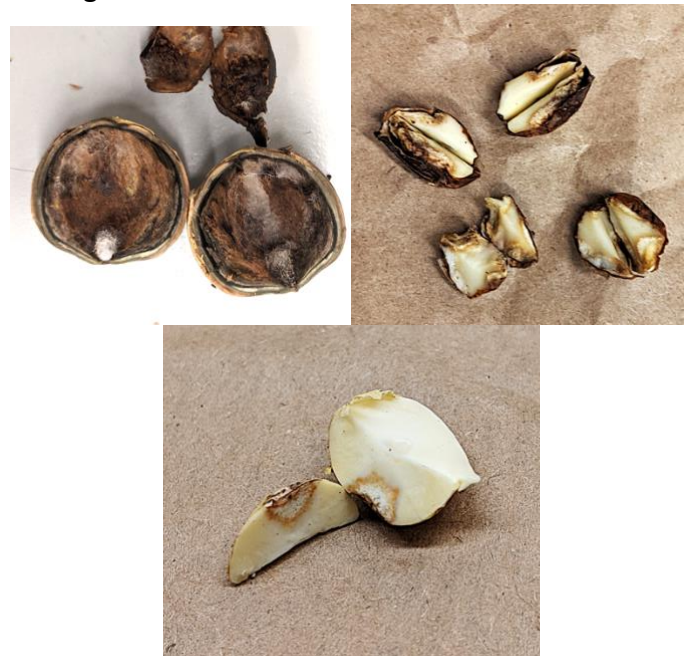
Generally, stink bug adults emerge from overwintering sites in May and begin mating and laying eggs on many different species of plants. The nymphs then also feed on these plants. Once nymphs have matured to adults around late-July/August, they become more mobile and can feed on many different crops (e.g., soybean, corn, apples, hazelnuts, etc.), especially favoring plant reproductive parts (i.e., seeds, fruits and nuts).

Stink bugs can cause different types of damage depending on the timing of feeding on hazelnuts:

early-season feeding can cause kernel abortion (i.e., blank nuts), mid-season feeding can cause shriveling of kernels and late-season feeding can cause “corking”, or discolored, dead spots (i.e., necrotic spots) on the kernels (see photos).

Current Status

Stink bugs are thought to be a mild and/or occasional threat to hybrid hazelnut production in the Upper Midwest. Outbreaks of stink bugs on hazels in the Upper Midwest are rare but have been reported from North Dakota. **Stink bugs are expected to be of higher significance in the lower Midwestern states.** For example, Missouri has reported large numbers of BMSB and stink bug damage in hazelnut orchards.



Photos: a) blank hazelnuts, b) shriveled kernels, and c) necrotic spots on kernel from stink bug feeding on hazelnuts. All photos by Hailey Shanovich.

Management

Identifying stink bugs to species can be tricky as many look very similar. There is now an app for accurate Midwest stink bug identification for smart phones for free download from both [Apple](#) and [Google Play](#). Additionally, there is a [guide to some Midwest stink bugs](#) that includes images of their juvenile stages, or nymphs. If you have identified BMSB in your orchard, you can monitor for them using pheromone traps. **Populations tend to build up as harvest approaches.** BMSB activity has found to be most intense on orchard crop borders. See the [Oregon handbook](#) for details.

Polydrusus weevils (*P. formosus* and *P. impressifrons*)

While there are several weevils in this genus native to the US, the two species most commonly found in hazel plants throughout the Midwest are introduced from Europe: the green immigrant leaf weevil (*P. formosus*) and the pale green weevil (*P. impressifrons*). The adult weevils feed on the leaves and buds of a variety of hardwood and fruit trees, and occasionally on select berry crops such as raspberry and strawberry. Adults of both species are iridescent green and about a quarter inch in length.



Photos: lateral and dorsal views of the green immigrant leaf weevil (top two photos) and the pale green weevil (bottom two photos). Photo by Pheylan Anderson, University of Minnesota.

Life cycle

Adult weevils begin to emerge from the soil in late-May/early-June and feed on plant buds and leaves through August. Females lay clusters of small, white cylindrical eggs into grooves of bark or the soil surface. Once the eggs hatch, the larvae burrow into the soil where they feed on the roots of plants and overwinter. Larvae continue feeding into the spring, and then pupate and emerge as adults come late May. A full list of the weevils’ host plants can be found [here](#).

Current Status

Adults can feed on buds and young leaves of plants, but their feeding very rarely damages hazel plants to our current knowledge. Larvae feed on the roots of the plants. Researchers at the UMN plan to investigate the extent to which *Polydrusus* weevils feed on and damage hazel plants. Some research in hybrid poplar trees has shown that in large numbers, the pale green weevil can severely damage new leaves and buds of young trees.

Management

Currently, control is only warranted if you observe severe defoliation on young hazel seedlings, but no thresholds have been established. However, no commercial insecticides are registered for use against *Polydrusus* weevils or other root weevils in hazelnuts in the US yet. Established hazel plants can withstand feeding from *Polydrusus* weevils because of their energy reserves and canopy size. Using hail netting over plants is a non-chemical option for preventing any aboveground insect feeding, although expensive.

Scale insects (*Parthenolecanium corni*)

Several species of scale insects can infest hazelnut orchards, but lecanium scale is the most common and problematic in hazels. Mature scales are up to 0.2 inch across, reddish brown to dark brown in color, and rounded, resembling raised bumps on the stems and branches of hazel plants. **Scale insects feed on the phloem in hazel stems and leaves via their piercing-sucking mouthparts.**

Life cycle

The insects overwinter as immatures on hazel stems and branches. Once spring, they resume feeding. **Females lay eggs underneath the scale coverings (i.e., visible bumps) from May – June.** The emerging young insects, called “crawlers”, migrate to the undersides of leaves to feed. This crawler stage is the life stage most susceptible to insecticide treatment. The crawlers are flat, oval, and pinkish brown. The crawlers can also be dispersed to other hazel plants and orchards by wind, rain, and irrigation or by the movement of plants and machinery. After 4 – 6 weeks on the leaves, the crawlers return to the stems and twigs to feed, mate and overwinter. There is one generation per year.

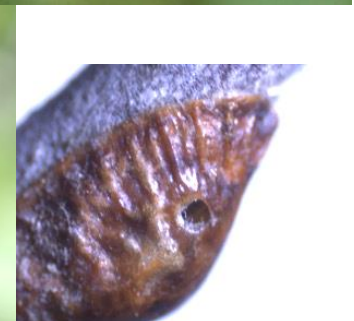
Current Status

Scale insects have piercing-sucking mouthparts like aphids; and like aphids, **severe scale infestations can kill branches and may reduce nut size and kernel fill.** Also, like aphids, when severe infestations occur, they can produce large quantities of honeydew, leading to growth of sooty mold fungus that impedes photosynthesis of the plant.

Management

There are 7 different insecticides registered for use against scale in hazelnuts in the US. Neem tree extract (i.e., azadirachtin) has also been approved for organic control. See the [Oregon State hazelnut](#)

[2022 IPM handbook](#) for details. **Applications should be avoided unless severe infestations are expected/seen.** However, large infestations of scales may actually be the result of previous broad-spectrum or excessive insecticide uses. Avoid applications when bees are actively foraging on honeydew. There are several parasites, or natural enemies, of scale insects. **You can monitor for biological control activity from scale parasites by scouting for small emergence holes on the mature scales where the parasite has chewed its way out of the host (see below).** Additionally, there is a *Cordyceps* fungus that feeds on the mature scale insects. **The *Cordyceps* fungus is easy to identify (see below).** Researchers at UMN have been monitoring biological control rates in hazelnut orchards around the Twin Cities and have seen 88% mortality of scales, from parasites and the fungus combined.



Photos: 1) scale insects on hazel stem with ants, 2) scale insect infested with *Cordyceps* fungus, 3) scale insect with parasite exit hole. All photos by Simone Traband, University of Minnesota.