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POPLAR-AND-WILLOW BORER

Insect Pest Management in Hybrid Poplars Series

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Poplar-and-Willow Borer

Cryptorhynchus lapathi (L.) (Coleoptera: Curculionidae)

Introduction

Poplar-and-willow borer larvae burrow into stems of all ages of poplar; their galleries weaken the bole and limbs of infested plants, causing them to break when stressed by high winds. There are no chemicals available to professional integrated pest management (IPM) personnel to control this pest. Professionals need to be able to identify the pest species, avoid using infested cutting for propagation, use properly timed harvest, and recommend long-term management strategies to minimize losses to poplar-and-willow borer infestations.

Taxonomy

There are two main taxonomic orders of insects that are the primary wood-boring pests of hybrid poplars in eastern Oregon and eastern Washington. They are Lepidoptera, or moths, and Coleoptera, or beetles. Lepidoptera species are discussed in greater detail in the publication on western poplar clearwing moth (Brown et al. 2006).

The main wood-boring beetles that attack hybrid poplars fall into three families. Buprestidae (Figure 1) or metallic wood-boring beetles, Cerambycidae (Figure 2) or long-horned borers, and Curculionidae, which comprise weevils and bark beetles. Curculionidae is one of the largest families of insects with 20 subfamilies. Within hybrid poplars grown in eastern Oregon and eastern Washington there are four weevil pests: *Cryptorhynchus lapathi* L., the poplar-and-willow borer, is in the subfamily Cryptorhynchinae (Anderson 2008), *Polydrusus impressifrons* and *Otiorhynchus ovatus* belong in the broad-nosed weevil subfamily Entiminae, and finally the bark beetle subfamily Scolytinae is represented by *Xyleborinus saxeseni* (Ratzeburg), commonly known as the fruit-tree pinhole borer.

Figure 1. Metallic wood-borer adult, Buprestidae (Image courtesy of VWR International, LLC).

Within the US there are other Coleoptera, Buprestidae that burrow into poplar trees. *Agrilus horni* Kerremans, the aspen root girdler, has been documented from northeast Massachusetts, west to South Dakota, southwest to Arizona, and in southern Canada from Ontario to Manitoba (Nord et al. 1965; Carlson and Knight 1969). *Agrilus granulatus granulatus* (Say) has been reared from *Populus trichocarpa*, *P. nigra*, and *P. deltoides* from the Great Plains east to New York and south to North Carolina and Louisiana (Fisher 1928; Carlson and Knight 1969). Through their formation of larval galleries, the bronze poplar borer, *Agrilus liragus* Barter and Brown can cause mortality in poplars (Ostry et al. 1988).

Long-horned borers, family Cerambycidae (Coleoptera), are common pests of poplars. Dramatically colored black and white cottonwood borer adults, *Plectrodera scalator* F. (Cerambycidae), are some of the larger beetles found in the US east of the Rocky Mountains (Solomon 1995). *Oberea schaumii* LeConte and *O. delongi* Knull (Cerambycidae) are both cottonwood twig borers found in the southeastern US (Furniss and Carolin 1977; Ostry et al. 1988). *Saperda calcarata* Say is a major pest of poplar and aspen east of the Rocky Mountains (Roe 2001) and *S. inornata* is a borer of aspen and poplar in the Lake States (Nord et al. 1972).

Hosts

The primary hosts of *C. lapathi* are poplar and willow (Furniss 1972), hence the common name, but *C. lapathi* can successfully breed in alder and birch (Smith and Stott 1964; Garbutt and Harris 1994). Among *Populus* species there are differences in *C. lapathi* susceptibility among species (Cadahia 1965; Dafauce 1976; Morris 1981; Abebe and Hart 1990; Mattson et al. 2001; Johnson and Johnson 2003; Broberg and Borden 2005; Broberg et al. 2005). Understanding tolerance and/or resistance will be important when managers and breeders choose production clones (Painter 1951; Smith 1989; Larsson 2002).

Figure 2. Longhorned beetle, Cerambycidae (Image courtesy of VWR International, LLC).

Range

Cryptorhynchus lapathi is from Eurasia (Chittenden 1904; Smith and Stott 1964) and was first reported in North America in 1882 (Schoene 1907) in New York City. The weevil is now widely distributed throughout the central latitudes of North America (Harris and Coppel 1967) and is still expanding its distribution (Broberg et al. 2002). It now has worldwide distribution in the north temperate regions.

Figure 3. Northern range of Cryptorhynchus lapathi (Anderson 2008).

Life History

There are six larval instars (Harris 1964; Harris and Coppel 1967; Ren et al. 1986), although Szalay-Marzso (1962) report only five. The first three instars feed close to the cambium, with later instars boring into the sapwood (Figure 4) in either branches or the bole of the tree, and mining upwards for 5–8 cm (Garbutt and Harris 1994). In the Pacific Northwest, adults (Figure 5) emerge beginning in late June with peak emergence in early August. Adults feed, mate, and oviposit on host plants until late October. Adults are capable of over-wintering in leaf litter and can be found mating and ovipositing in small burrows in the bark in the early spring of the following year (Harris 1964). Once the first instars hatch in June, they enter diapause as first instar larvae until the following spring (Garbutt and Harris 1994), completing development in August and emerging as adults. Therefore, the life cycle is two, perhaps three, years.

Damage

The detritus from weevil larval galleries is conspicuously different from detritus of moth larvae, which are the other main group of wood-boring insects within poplars. The weevil detritus, which originates from sapwood, is stringy, moist (Figure 6), and often clumped together (Figure 7; Hannon 2006).

The two other wood-boring insects, the carpenterworm *Prionoxystus robiniae* (Peck) (Lepidoptera: Cossidae) and the western poplar clearwing moth *Paranthrene robiniae* (Hy. Edwards) (Lepidoptera: Sesiidae) both produce detritus that is chunky, like sawdust, and is dry since it originates from the heartwood. Stringy detritus in galleries is indicative of all Coleoptera borers in poplar, *Cryptorhynchus* spp. Curculionidae, *Agrilus* spp. Buprestidae, and *Oberea*, *Plectrodera*, and *Saperda* spp. Cerambycidae.

Populations of *C. lapathi* spread out from initial epicenters year after year. Adults can fly, but seldom do. Mated females often walk in search of a host plant. Poplar and willow are riparian trees, limiting their local range, thus rewarding weevil behavior of infesting neighboring trees. Therefore, poplars grown for biofuel, pulp, and saw timber provide an optimum habitat for poplar-and-willow borers.

Multiple attacks on individual trees weaken the tree and increase the stand's susceptibility to wind damage (Figures 8 and 9). A single wind event can cause an entire group of infested trees to fall.

Figure 4. Poplar-and-willow borer larva within stem. Notice stringy detritus (Photo by E.R. Hannon).

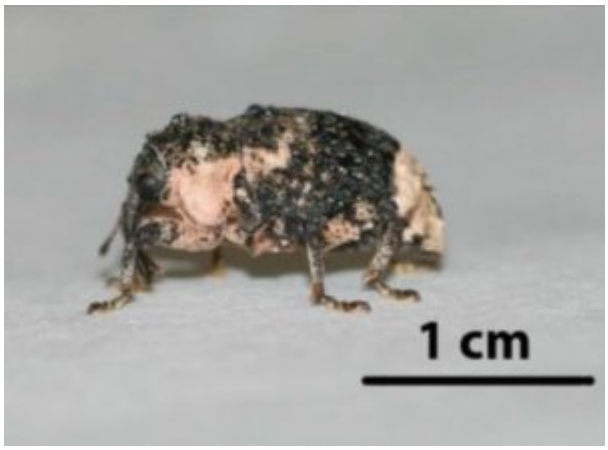

Figure 5. Adult poplar-and-willow borer (Photo by E.R. Hannon).

Figure 6. Seepage from an infestation of poplar-and-willow borer as indicated by stringy detritus at the exit hole (Photo by E.R. Hannon).

Figure 7. Seepage and detritus from poplar-and-willow borer exit hole (Photo by E.R. Hannon).

Figure 8. Wind-lodged poplar after infestation of bole by poplar-and-willow borer (Photo by E.R. Hannon).

Figure 9. Poplar-and-willow borer larval gallery, with stringy textured detritus (Photo by E.R. Hannon).

Biological Control

Cryptorhynchus lapathi is an invasive species and there are no known natural enemies in the US or Canada at this time. Biological control of this pest by experimentally injecting entomopathogenic nematodes (Cavalcaselle and Deseo 1984) or fungi (Cavalcaselle 1975) into the larval galleries would be too labor intensive to protect poplars grown for pulp or biofuels.

Monitoring

Perhaps no other monitoring technique is more important than weekly surveys throughout the growing season. After leaves are off the trees in late autumn, an annual survey should target infestations of stem, bark, and bole pests. These observations also should be shared with other employees and revisited each year to determine the areas with the most serious infestations. Once an epicenter of *C. lapathi* infestation is located, these areas should be revisited annually.

Poplar-and-willow borer populations are best monitored after trees have dropped their leaves in the autumn, which is the recommended practice for all boring insects found in hybrid poplar farms. Black seepage on the bole of the tree denotes a possible borer infestation that can be observed from a distance (Figure 6). A closer inspection should reveal stringy or chunky (with a sandy texture) detritus being eliminated from larval galleries (Figure 7), thereby confirming the infestation is a beetle or moth larva, rather than a disease organism, that is causing the seepage.

Management

Johnson and Johnson (2003) reported that poplar-and-willow attack among clones was affected by genotype. Hannon et al. (2008) assessed the variability in *C. lapathi* to clone preference. Results indicated that *C. lapathi* were significantly more successful at establishing a population in two clones with *Populus trichocarpa x P. deltoides* (T*x*D) parentage (Female *x* Male) than in either the two clones with *P. deltoides x P. nigra* (D*x*N) parentage (Female *x* Male), or a single clone of *P. deltoides x P. maximowiczii* (D*x*M) parentage (Female *x* Male).

Dormant propagation stock should be examined for *C. lapathi* infestation before planting. If a pole has an individual *C. lapathi* gallery, it is usually at the base of the tree and can be eliminated by cutting that portion of the pole off before planting the rest. Poles that have six or more *C. lapathi* galleries should be rejected for replanting (R.A. Rodstrom, pers. comm.).

Adult weevils are abundant in late summer, early fall, and females are ovipositing into trees at that time. Late fall or winter harvest of biofuel, pulp, and non-structural timber can greatly depreciate the number of surviving weevils.

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