

Colorado Insect of Interest

Gambel Oak Borer

Scientific Name: *Agrilus quercicola*
(Fisher)

Order: Coleoptera (Beetles)
Family: Buprestidae (Metallic Wood Borers/Flatheaded Borers)

Gambel oak borer is an insect native to Colorado, associated with forest stands of Gambel oak. Under normal conditions this is not a pest species, limiting its development to damaged/overshaded/stressed limbs. In extraordinary conditions, when Gambel oak is severely stressed by drought and/or other insults such as late spring freezes that destroy newly flushed foliage, the insect may develop large populations and cause more severe injury.

During one period, following a sustained period of severe drought along the Front Range in 2000-2002, this insect developed extremely high populations – and then many migrated over 30 miles to infiltrate the Denver Metro areas. Many kinds of oaks were killed or seriously damaged by this insect throughout the area during this year. Good rainfall in 2003 occurred, alleviating the moisture stress to the trees that favored this insect, and the outbreak abruptly ended.

Following that 2003 event this insect largely disappeared as pest in the urban forest of the Metro Denver area. However, since 2017 there have been reports of this insect causing serious damage to oaks, particularly *English oak*, in areas of Boulder, Denver, Douglas, and Jefferson counties.

Description and Distinctive Features: Gambel oak borer adults have an elongate body form and is about 7-8 mm long. The wing covers that extend over most of the back are dark gray with a metallic sheen. The



Figure 1. Adults of the Gambel oak borer.



Figure 2. Extensive tunneling of oak by Gambel oak borer larvae.
Photograph by David Leatherman.

area behind the head (prothorax) is more bronze colored or a greenish-bronze. This latter feature can be useful to distinguish Gambel oak borer from the many other related species of metallic wood borers (*Agrilus* species) that occur on other kinds of trees and shrubs in Colorado.

The larvae, which occur underneath the bark, are a type of flatheaded borer. They are pale colored and have a very elongated body form, somewhat worm-like. They are legless and have a slightly flattened area behind the heads. The larva is soft-bodied, except for the dark jaws.

Distribution in Colorado: Gambel oak borer is almost always found in forest sites areas where native Gambel oak are present. Occasionally they colonize nearby urbanized areas where they have may develop in planted oaks, particularly English oak.

Life History and Habits: Gambel oak borer has an annual life cycle, completed in one year. Adults will normally begin to emerge from trunks and larger branches of oak in late May. Emergence of new adults will continue through June and peak numbers are present in early summer. Flights then decline and very few adults are normally still active after midAugust.

For the first couple of weeks after emerging, adults feed on leaves of oak. Mating occurs at this time and females mature eggs. The females will then lay several dozen eggs over the next few weeks, Eggs are laid on the exterior of oak trunks/branches, often in crevices/protected sites of the bark. The eggs will hatch a week or two after being laid and the tiny, newly hatched flatheaded borer tunnels through the bark settling in the cambium area where it will feed and develop.

The larvae continue to grow and feed through summer. When full-grown, they cease feeding and make a shallow chamber a bit more deeply into the wood, and winter is thought to be spent as a full-grown larvae in this chamber. In spring development continues, they transform to the pupal stage, then ultimately to the adult, which escapes from the tree by chewing a D-shaped exit hole through the bark.



Figure 3. Larva of the Gambel oak borer. Photograph from the Jefferson County Extension Plant Diagnostic Clinic.



Figure 4. Gambel oak borer larvae exposed in the cambium area.

Management Suggestions

Cultural Controls. Gambel oak borer is a borer that is not highly aggressive in its ability to successfully attack and reproduce within most oaks. In natural stands of Gambel oak significant injury will normally be limited to trees that are seriously stressed, and often may be limited to limbs. Improving growing conditions for a tree, particularly by providing supplemental irrigation, if needed, is particularly important.

Newly transplanted trees will be at elevated risk of damage by borers until the plants get well established at the new site. This will take a few years, and care of the tree in ways that accelerate its establishment after transplanting will reduce risk of injury by Gambel oak borer.

Biological Controls. A parasitoid wasp, *Phasgonophora sulcata*, is known to attack Gambel oak borer and may be a significant natural control of this insect. The presence of this insect is evident from the production of round exit holes, about the same diameter as the D-shaped exit holes made by the Gambel oak borer. There is no way to enhance the activity of this natural enemy, but it was observed during 2003 to attack over 80% of the borers at one site.

Insecticide Options. There are a couple of insecticide options that should be able to control Gambel oak borer in English oak, adapted from information developed for managing related borers (e.g., bronze birch borer, twolined chestnut borer, emerald ash borer).

There are two approaches for using trunk sprays. The first of these would be a **“standard” borer trunk spray** using an insecticide that persist on bark to kill adults and newly emerging young as they hatch from the eggs. These sprays are best applied just before adults begin to lay eggs on the bark and coverage needs to be maintained through the egg laying period. Information on this insect is that it begins to fly in early June and eggs can be expected to be laid on the trunk from early June through early July.

A single application of insecticides such as bifenthrin (Onyx, Bifen) and permethrin (Astro, Permethrin, Tengard, Hi-Yield 38 Plus) applied at wood borer rates as a drenching spray on bark



Figure 5. Adult Gambel oak borer resting on leaf. Photograph by Josh Morin.



Figure 6. Adult Gambel oak borer chewing a D-shaped exit hole as it emerges from the trunk. Photograph by Andrea Sever.

should be able to provide protection of trees. It is suggested that applications be made around the *first week of June or very late May*. Applications made too early may result in residues of the insecticide declining too much to provide control during the later period of egg laying (late June, early July). Applications made too late will result in some eggs hatching and larvae entering the tree, after which time these types of trunk sprays will not be effective. All areas of the trunk and the lower surfaces of larger limbs should be covered with the spray. Eggs will usually be laid in bark crevices or under loose bark so applications need to be thorough enough to cover these sites.

Dinotefuran bark sprays are an alternative. This involves the insecticide dinotefuran (Safari, Transtect, Zylam) that can move systemically in plants and can be applied as a spray to the bark of trees. Targets for this application are small larvae feeding under the bark and there may be some control of adults that feed on leaves. For control of the small larvae that have already entered the trunk treatments can be a bit later than with the “standard” trunk sprays using non-systemic pyrethroid insecticides.

When using dinotefuran as a bark spray label directions indicate a fairly high concentration of the product be applied as a band sprayed on the lower trunk. A suggested time for this application to control Gambel oak borer is *early to mid June*, although there is likely some latitude (a bit earlier, a bit later) in the timing with this treatment.

Soil-applied systemic insecticides are the third option. This usually involves the insecticide imidacloprid, a product that is widely available in both commercial formulations (Merit, Mallet, Zenith, many generics) and some over-the-counter formulations sold at many nurseries, hardware stores and box stores. (Products sold in Colorado that contain imidacloprid for use on shade trees are sold under various brand names including Bayer, Bonide, ferti-lome, and Hi-Yield).

Imidacloprid is applied as a soil drench over the roots of the tree, and drench applications can focus around the base of the tree where many feeder roots occur. Alternately this product can be soil injected. In any case, all soil applications of imidacloprid *require that the soil of the treated area be kept moist enough for the insecticide to be picked up by the roots*. These treatments will



Figure 7. Trunk of fastigate English oak showing exit holes made by emerging adult beetles. Photograph by Tony Hahn.



Figure 8. Tunneling produced by larvae of Gambel oak borer. Photograph by Tamla Blunt.

have irregular and often unsatisfactory results in dry sites that are not irrigated after application and the soil kept moist for at least two weeks.

Targets for imidacloprid are small larvae under the bark and also adults that feed on leaves before they lay eggs. As there is a lag time for imidacloprid to move to the roots then move through the tree, somewhat earlier treatment timing is suggested – *early-mid May* would likely be more appropriate than early June with this treatment.

There are other options. In addition to imidacloprid soil applications of chlothianidan (Arena) or dinotefuran may be effective for control of this insect. (Soil drench/injections of acephate *are not* recommended for control of wood borers.)

And there is also option of the **trunk injection** of emamectin benzoate, used widely for emerald ash borer control. This is the most expensive option and does require some trunk wounding to apply. Although properly made trunk injections in other kinds of trees, notably ash, can most always easily overgrow/close the wounds with no adverse effects, injections of some oaks (bur oak) sometimes have problems with prolonged oozing from the injection site. Therefore, trunk injections of emamectin benzoate in this situation seem most suitable only for attempts to rescue trees in advanced decline from Gambel oak borer.