



EXTENSION

# Pest e-alerts



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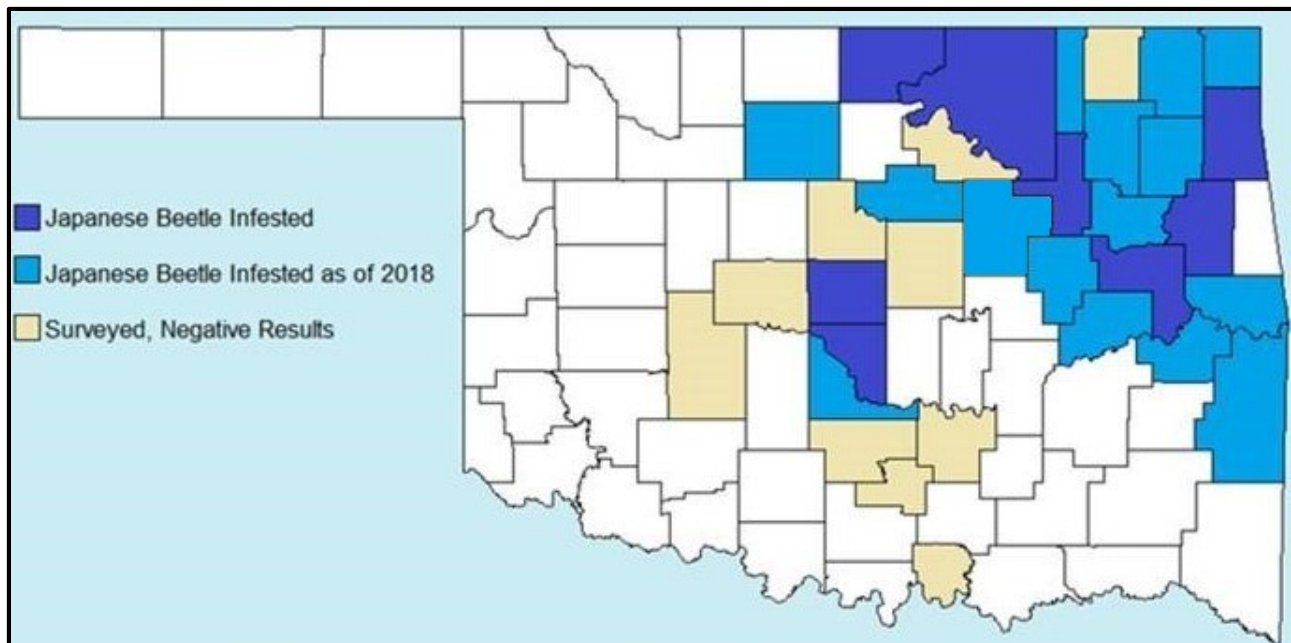
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August 3, 2020

## Japanese Beetles Continue Westward Expansion through Oklahoma

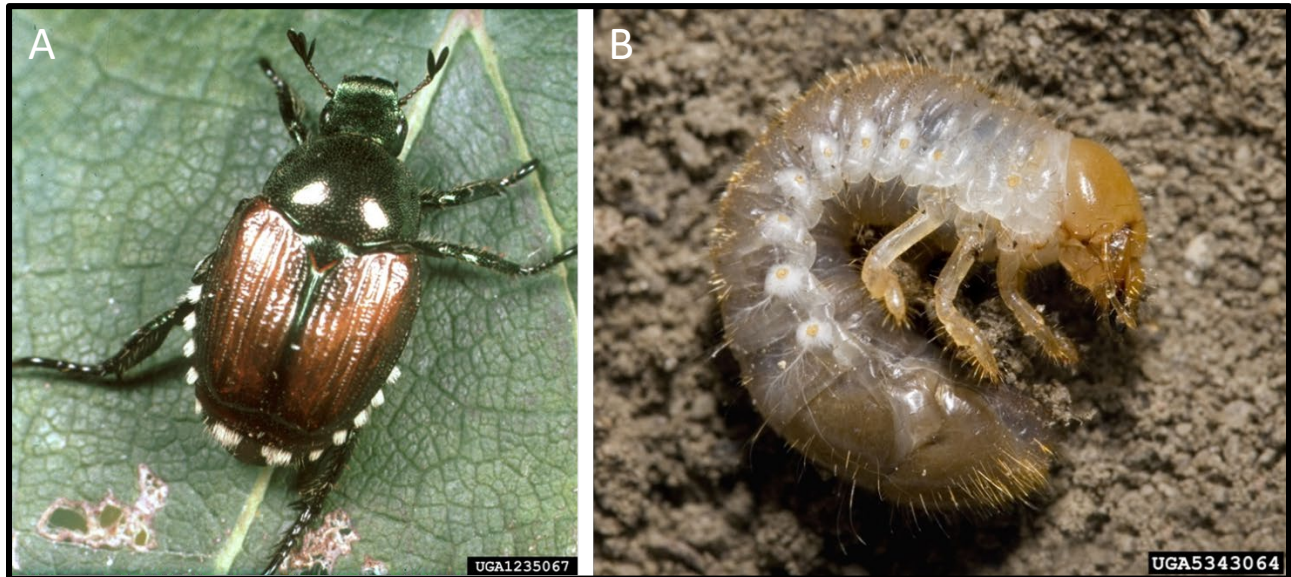
Eric J. Rebek, Extension Entomologist

The Japanese beetle, *Popillia japonica* Newman, has been abundant and causing heavy damage to a wide variety of ornamental and fruit plants this summer. While this invasive, devastating pest has been in Oklahoma for well over a decade, it continues to gain ground as it expands further west through our state (Figure 1). Japanese beetle is one of the most significant insect pests where it occurs because it congregates in large numbers, feeding on the foliage, fruits, and flowers of more than 300 plant species. Some of its favorite ornamental host plants include roses (*Rosa* spp.), flowering crabapple (*Malus* spp.), zinnias (*Zinnia* spp.), birch (*Betula* spp.), and elms (*Ulmus* spp.). Japanese beetle is also an important pest of grapes (*Vitis* spp.) and other fruit crops as well as row crops, including corn and soybean.



**Figure 1.** Distribution of Japanese beetle in Oklahoma based on survey data provided by Oklahoma Department of Agriculture, Food and Forestry. Note the map has been updated by the author to reflect new distribution data since 2018.

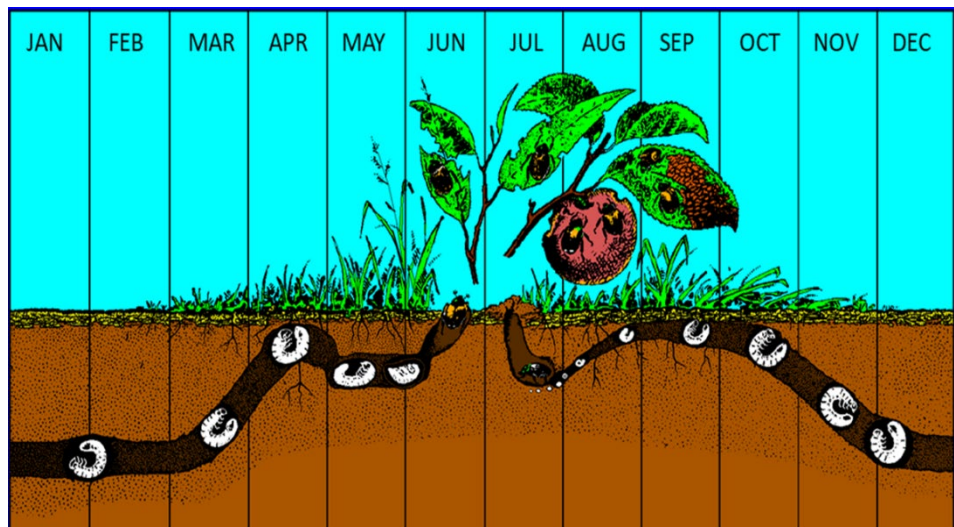
**Description:** Adult Japanese beetles are robust and measure about 3/8 inch (9.5 mm) long and 1/4 inch (6.5 mm) wide. The body is metallic green with bronze wing covers. A row of white tufts of hair are found along each side of the body next to the outer edge of the wing covers (Fig. 2A). The larva is a typical C-shaped white grub with a brown head and three pairs of short legs (Fig. 2B). Larvae develop through three instars (stages) before pupating. First instars measure about 1/16 inch (1.5 mm) long and third instars are about 1 and 1/4 inch (32 mm) long.



**Figure 2.** Japanese beetle adult (A) and larva (B). Photo credits: Whitney Cranshaw, Colorado State University, Bugwood.org; and David Cappaert, Bugwood.org, respectively.

**Distribution:** Japanese beetle is native to Asia and was accidentally introduced to the U.S. in 1916 in Riverton, New Jersey. It is likely that this exotic, invasive insect arrived as white grubs hitchhiking within the root zone of irises shipped from Japan. The beetle is common in all states east of the Mississippi River, except Florida, and is steadily encroaching westward. The distribution of Japanese beetle in Oklahoma is expanding and now includes 23 counties located in northern, eastern, and central Oklahoma.

**Life Cycle:** Japanese beetles have one-year life cycles and overwinter as third instar larvae (Fig. 3). In late March, overwintering larvae migrate upward through the soil profile and resume feeding on plant roots until May, when they form an earthen cell and pupate. Adults emerge late June through July and are active during the day, commonly found feeding and mating in large numbers on susceptible plants (Fig. 4A). Females repeatedly enter the soil and can lay 40-60 eggs during their lifetime. Eggs hatch 1 to 2 weeks later and first instars begin feeding on plant roots. The first instars molt in 17 to 25 days, while second

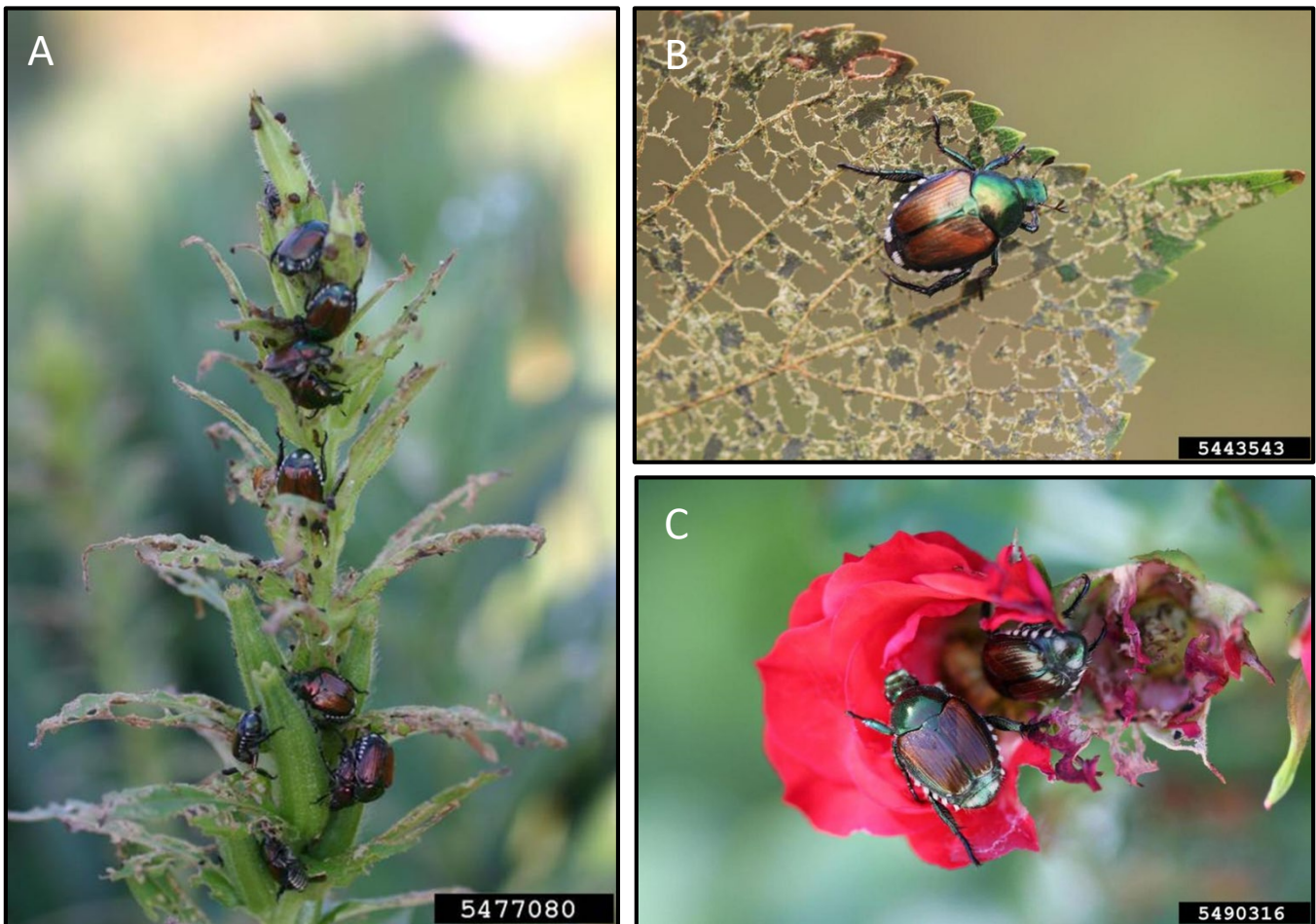


**Figure 3.** Life cycle of Japanese beetle. Diagram created by David Shetlar, The Ohio State University.



instars take 18 to 45 days to develop and molt once more. Most grubs reach third instar by late September, and by October they dig deeper into the soil to overwinter.

**Damage:** Adults feed during the day, preferring hot weather and plants located in full sun. When feeding on foliage, they consume the softer leaf tissue and avoid leaf veins. This creates a pattern of damage that is referred to as “skeletonization” (Fig. 4B). When feeding on fruit and vegetable crops, defoliation often results in reduced yield. Healthy host plants can survive even complete defoliation by the beetle, but young or weak host plants may not be able to withstand heavy attacks. Adults also feed directly on fruits and flowers of ornamental, fruit, and vegetable plants (Fig. 4C). Feeding damage to these tissues is characterized by large holes, and fruits and flowers are often consumed entirely under intense pest pressure.

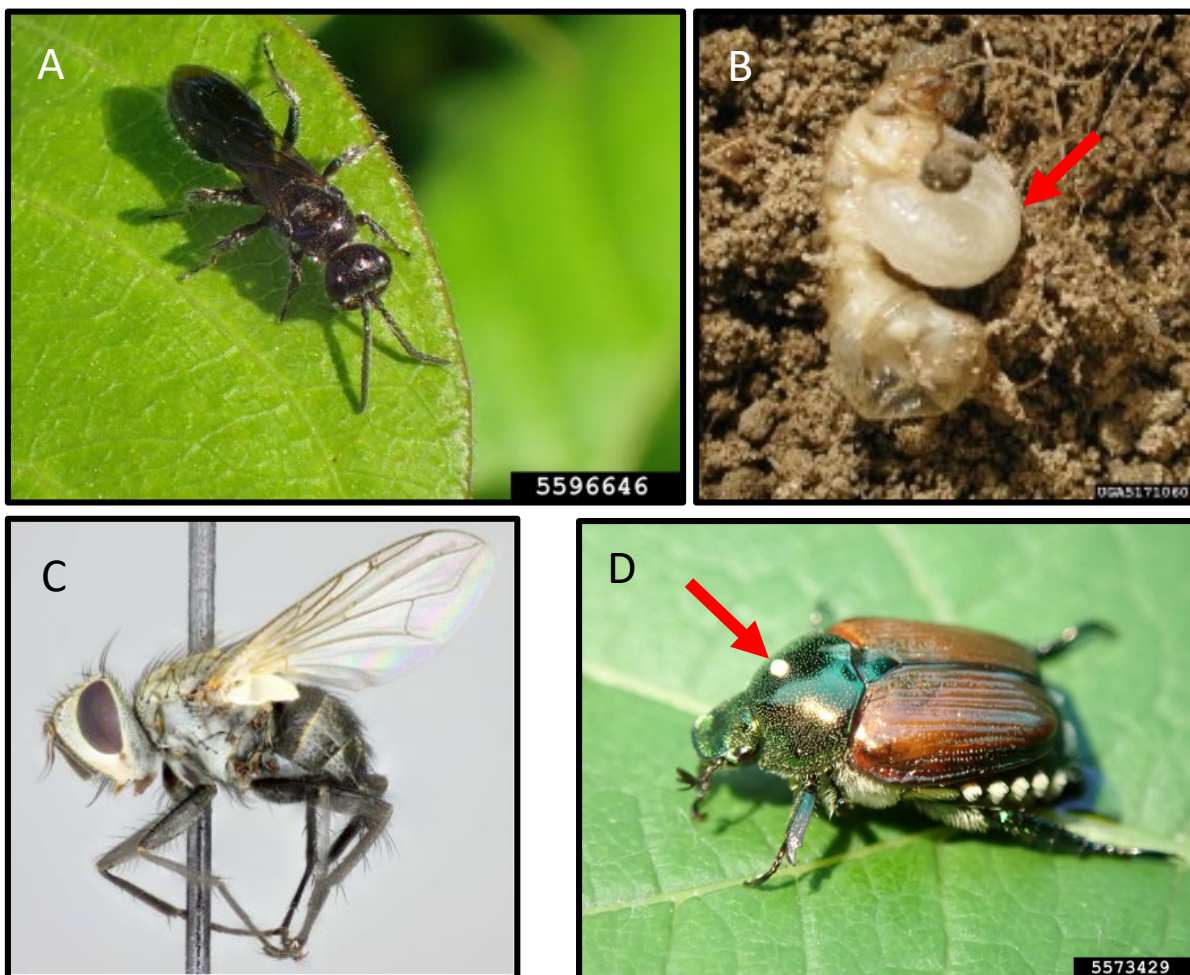


**Figure 4.** Japanese beetles often occur in large aggregations to feed and mate (A). Defoliation manifests as skeletonized leaf tissue (B). In addition to foliage, Japanese beetles feed on fruits as well as flowers (C). Photo credits: Leslie Mehrhoff, University of Connecticut, Bugwood.org; Steven Katovich, Bugwood.org; and Whitney Cranshaw, Colorado State University, Bugwood.org, respectively.

**Management:** Handpicking adult beetles can be effective when they first colonize landscape plants. Beetles are less active in the morning and evening when it is cooler and can be killed by dropping them in a bucket of soapy water. Japanese beetle traps, which contain an aggregation pheromone and a floral lure to attract both males and females, have been commercially available for many years. However, these traps usually attract more beetles than they capture, leaving landscape plants vulnerable. In addition, adult Japanese beetles can fly one mile or more, so beetles that are caught in traps are readily replaced in the landscape by colonizing individuals. Thus, the use of

Japanese beetle traps is generally not recommended. The only situation where traps may be useful is if traps are used across a large area like an entire neighborhood. If traps are used, they should be checked and emptied regularly, making sure to kill any live beetles by dunking them in soapy water.

Biological control of Japanese beetle is an active area of research, and several species of natural enemies have been released including parasitoids such as the spring tiphia, *Tiphia vernalis* Rohwer, and the winsome fly, *Istocheta aldrichi* (Mesnil) (Figure 5). However, establishment and, therefore, effectiveness of these natural enemies has been met with limited success. Efforts are now being directed toward biological control of these beetles with parasitic nematodes and disease-causing microbes. Several insecticide products containing these agents have been brought to market over the years, but their availability to homeowners and landscape professionals ebbs and flows. A nematode species, *Steinernema scarabaei*, is now available in the U.S. as a product called Nemagard, which targets most species of white grubs (larvae) including Japanese beetle. However, targeting Japanese beetle larvae is not an effective approach to managing this species because adults are strong fliers. Thus, treating white grubs in your yard does not prevent adult beetles from attacking your plants from surrounding landscapes.



**Figure 5.** Biological control agents released in the U.S. against Japanese beetle include spring tiphia, *Tiphia vernalis*, adult (A) and larva feeding on a Japanese beetle larva (B) (indicated by red arrow), and winsome fly, *Istocheta aldrichi*, adult (C) and egg laid on a Japanese beetle adult (D) (indicated by red arrow). Photo credits: Whitney Cranshaw, Colorado State University, Bugwood.org (A and D); The Tachinid Times, Issue 27, 2014 (C); and Michael Redding, USDA-ARS, Bugwood.org (B).

There are many insecticides labeled for Japanese beetle control, and several are available to homeowners. Look for insecticide products containing acephate (Orthene), carbaryl (Sevin), bifenthrin, cyfluthrin, deltamethrin, lambda-cyhalothrin, or permethrin. When adult activity is heavy, insecticide sprays may be needed every 5 to 10 days. Applications of imidacloprid (e.g., Bayer Advanced Tree & Shrub Concentrate) should be made at least 20 days prior to Japanese beetle adult activity. However, check the label carefully for pollinator protection requirements for use of products containing imidacloprid and other neonicotinoid insecticides. For insecticide recommendations for nurseries, homeowners, and fruit crops, refer to E-832: OSU Extension Agents' Handbook of Insect, Plant Disease, and Weed Control.

### References:

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The pesticide information presented in this publication was current with federal and state regulations at the time of printing. The user is responsible for determining that the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label directions. The information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Cooperative Extension Service is implied.

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