

# Japanese Beetle Management in Minnesota

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## Japanese beetle (*Popillia japonica*) Family Scarabaeidae

The Japanese beetle (JB) is a serious pest of turf and ornamental plants. Grubs feed on the roots of grass and adults feed on the foliage of more than 300 plant species. Japanese beetles were first found in United States in 1916, after being accidentally introduced into New Jersey. Until that time, this insect was known to occur only in Japan where it is not a major pest. It is controlled in the eastern United States by soil-inhabiting protozoans that are not present in Minnesota. There are two biological control agents, the fly *Istocheta aldrichi* and the tiphid wasp, *Tiphia vernalis*, but they do not control infestations.

There are a number of related beetles in the family Scarabaeidae that feed on the roots of grasses. In Minnesota, JB is the worst pest, so you need to identify grubs to species as the life history varies and management is not the same for all species. A management program consists of identifying grubs to species, determining grub numbers, identifying thresholds, timing pesticide application to smaller grubs, and monitoring the treated area for results.

## Identifying adult Japanese beetles

Japanese beetle adults are approximately 3/8 inches in length with a dark metallic green head and metallic dark tan wings. Key characteristics for adult JB are two white rear tufts and five white lateral tufts of hair (Figure 1).

Figure 1. Adult stages of several white grub species.



adult Japanese beetle  
*Popillia japonica*

Japanese beetles have two white rear tufts and five white lateral tufts of hair. Adults found on plants.



adult False Japanese beetle  
*Strigoderma arvicola*

False Japanese beetles lack the five white hair tufts along wing margin. Adults rarely seen.



adult rose chafer  
*Macrodactylus subspinosus*

Rose chafer are a light green tan color with long legs. Adults found on plants.



adult May/June beetle  
*Phyllophaga* species  
Adults found at lights.



adult masked chafer  
*Cyclocephala borealis*  
Adults do not feed so not  
found at lights or plants.



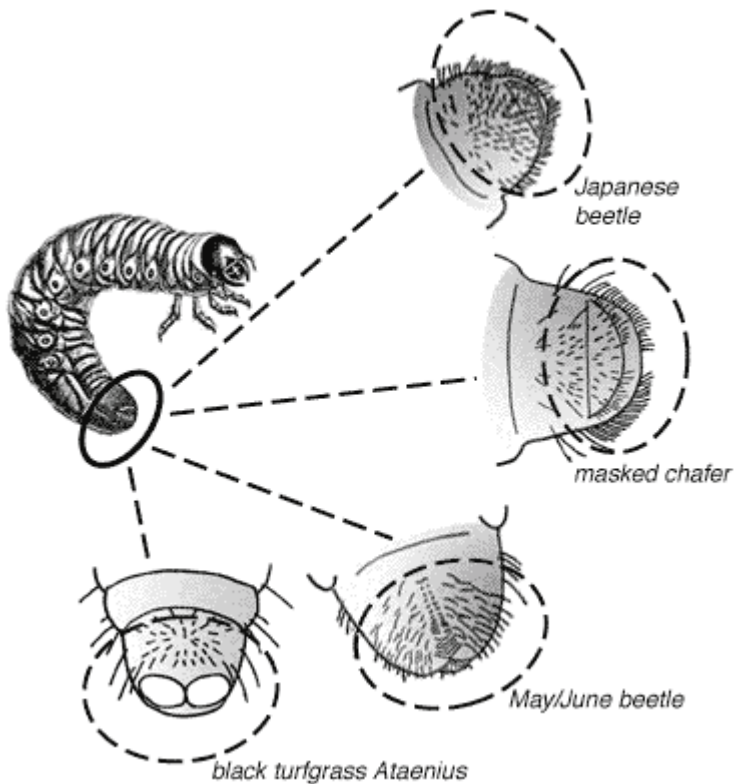
adult black turfgrass  
*Ataenius*  
*Ataenius spretulus*  
The smallest species found  
in turf with high organic  
matter.

## Identifying the grub stage of Japanese beetles

Japanese beetle larvae or grubs are “C” shaped and live in the soil and feed on grass roots. JB was recorded to feed on the roots of corn, beans, tomatoes, and strawberries.

Grubs can be identified to species by the pattern of hairs on their brown hind ends (raster). Using a 10-power hand lens, you can see that the hairs on the raster of Japanese beetle form a small “V” shape just below the anal slit (Figure 2).

**Figure 2. Grub rastral patterns are used for identification. The hind end of the grub, its raster, contains sutures with hairs. JB has a small “V” shape suture with hairs. Clockwise from top are rasters of Japanese beetle, masked chafer, May/June beetle, and black turfgrass *Ataenius*.**



## Scouting for grubs

Grubs chew off grass roots and reduce the ability of grass to take up enough water to withstand stresses of hot, dry weather. As a result, large dead patches of grass develop in grub infested areas. These dead patches can be rolled back like a carpet to expose the lack of turf roots. Grubs can be found in adjacent green areas. Early recognition of the problem can prevent this destruction. Starlings and crows, as well as moles, shrews, and skunks may be seen digging up grubs, also damaging the turf.

Grub populations between 7 and 15 per square foot can cause significant damage to non-irrigated turf. Irrigated turf can withstand a higher grub count because the increase in water compensates for the roots chewed off by the grub.

## Japanese beetle life cycle

Adults emerge from the soil in early July, feed, mate, and lay eggs. In July adults are noticed feeding on vines, linden trees, roses, and many other ornamentals. Activity is most intense over a 6 to 8 week period, after which the beetles gradually die off. Individual beetles live about 60 days. Over 2 months females can lay a total of 60 eggs.

JB adults feed in full sun at the top of plants, moving downward as the leaves are consumed. Odors emitted from beetle-damaged leaves causes beetles to aggregate. Also, adults release an attraction pheromone that causes them to aggregate. At dusk, this pheromone is no longer produced and the females fly to turf to lay eggs. Females burrow 2 to 3 inches into the soil and lay their eggs. The grubs grow quickly and by late September are almost full-sized (about 1 inch long). When the soil cools to about 60°F in the fall, the grubs begin to move deeper. Most pass the winter 2 to 6 inches below the surface, although some may go as deep as 8 to 10 inches. Grubs feed again in May when ground temperatures are above 50°F (Figure 3).

## Timing pesticide application

Adults fly long distances to food plants; so adult infestations do not indicate turf infestations. Timing of pesticide treatment is important. Insecticides for grubs can be applied from May through mid-June, when recently overwintered grubs (larvae) start feeding. However, these grubs are large and may be difficult to kill. Starting in mid-June most grubs are in the pupal stage and insecticides are not effective. In early July adults emerge to feed on plants, mate, and then at night fly to grass to lay eggs. The best time to apply insecticides for grubs is from mid-July until early September. Granular applied insecticides distributed on soil with a spreader are usually the best insecticides for JB (Figure 3).

**Figure 3. Life cycle of Japanese beetle: egg, grub, and adult stages. In June, the grub turns into a pupa. It emerges from the soil in late June and July as an adult, to mate and lay eggs. Females live for a few weeks feeding on trees, shrubs and roses in the morning, returning to the turf in the afternoon to lay more eggs. Eggs hatch in July and grubs are almost full grown by late August. Grubs dig deep in the soil for the winter months and then move upward in spring as the soil warms. Grubs do best in warm, slightly moist soil that has plenty of organic matter and tender grasses. However, they can survive in almost any soil.**









Plants that attract beetles		Plants seldom damaged		
American chestnut	flowering crabapple	American elder	hemlock	silver maple
American elm	grapes	arborviate	holly	spruce
American linden	hollyhock	black oak	juniper	white ash
American mountain ash	horse chestnut	boxelder	pine	white oak
apple	Norway Maple	common lilac	red maple	white poplar
birch	plum	euonymus	red oak	yew
black cherry	roses	fir	rhododendron	
cherry	walnut	green ash	scarlet oak	

## References

The spraying of insecticides on bee lawns for JB grubs and on leaves and flowers for JB adults, probably results in the most insecticide used in urban and park lands, which may have non-targeted consequences for pollinators. Fortunately, JB has a natural biocontrol agent that was discovered in 1988 in Connecticut that kills JB grubs and reduces reproduction in adult females that needs to be introduced into MN. The microsporidian (fungal) pathogen called *Ovavesicula popilliae* was studied at Michigan State University (MSU) and released in five states, Arkansas, Colorado, Kansas, Kentucky, and Michigan. For the long term, research is needed to survey greater MN for the presence of JB and the pathogen, which so far was found in two locations in Stillwater and UM Experiment Station Campus in Saint Paul, MN. Research is underway to identify, culture, and disseminate the biocontrol pathogen. For the short term, integrated pest management (IPM) programs using pollinator friendly chlorantraniliprole and microbial insecticides need to be developed that conserve pollinators and kill JB. However, recent research showed that chlorantraniliprole is highly toxic to larval and adult butterflies.

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