



Best Survey Period



**Status:** State special concern

**Global and state rank:** G3/S1S2

**Family:** Noctuidae (owlet moths)

**Range:** The blazing star borer occurs as a series of disjunct populations throughout the midwestern United States having been recorded from the following states: Iowa, Illinois, Indiana, Ohio, Wisconsin, and Michigan.

**State distribution:** The blazing star borer is known from less than 12 sites in Michigan and has been reported from ten counties. It has been collected from several southern counties (Allegan, Berrien, Calhoun, Washtenaw, Monroe, Livingston, Oakland, and St. Clair) and one county in the northern lower peninsula (Otsego).

**Recognition:** This moth, in the family Noctuidae, has a wing-span of 31-36 mm (1.2-1.5 in). It has two color forms, both spotted and unspotted. **The unspotted form has forewings which are dull brownish, frosted with whitish scale-bases, and with scattered white scales;** markings practically absent or very faint (Forbes 1954). The hind wings are a paler and more uniform gray. **The spotted form, lacinariae Bird, has forewings similar to the unspotted form with the exception of white spots** (Forbes 1954). Many species of *Papaipema* are difficult to identify but most can be sorted into species groups (Rings et al. 1992). These species groups can then be sent to experts for positive identification. Series (5 to 10 individuals from the same location) of specimens are easier to work with

because of the large amount of individual variation. In addition, many field-collected specimens can be quite worn (many of the scales missing) giving the specimen a lighter appearance than normal, or eliminating many of the scale characteristics important for identification. To add to the confusion some species, like the blazing star borer, have spotted and unspotted forms, both of which are sympatric (occur at the same location at the same time).

**Best survey time:** The blazing star borer is a late-season flier with Michigan adult capture dates ranging from 13 September through 5 October. The best way to survey for this species is by blacklighting, a technique where a sheet is stretched across two trees or poles and an ultraviolet light is used to attract moths to the sheet. Moths can be collected directly from the sheet. You also can search for the larvae of many species of *Papaipema* by searching for signs of feeding activity in late July or early August. This includes inspecting blazing star (*Liatris* spp.) plants that are wilted or otherwise stunted, for a small hole near the base of the plant and a pile of frass (caterpillar feces) near this opening. Often times you can see the pile of frass at the base of the plant and then locate the hole in the stem.

**Habitat:** The blazing star borer occurs with its larval host plant, blazing star or snakeroot (*Liatris* spp.) In Michigan the species has been recorded from a variety of plant communities crossing gradients from wet to dry including lakeplain prairies, prairie fens, and sand prairie or barrens. Many Michigan sites represent only small parcels of what was once widespread habitat. At



known sites associated prairie plants typically include big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), common mountain mint (*Pycnanthemum virginianum*), tall coreopsis (*Coreopsis tripteris*), Ohio goldenrod (*Solidago ohioensis*), Culver's root (*Veronicastrum virginicum*), and switch grass (*Panicum virgatum*).

**Biology:** Eggs are laid on or near the food plant in the fall and hatch in the spring around mid-May (Bird 1923). Larvae can be found in the root and lower stem of the host plant in most years from 14 July-7 August. Feeding and tunneling in the root causes the plants to wilt and the leaves can turn brown at the tips. The final instar leaves the root and pupates in the soil near the plant. Pupae can be found from 10 August until the adult flight times of 13 September through 5 October. *Papaipema* moths as a whole fly late in the season, usually late August through October. There is also limited data that suggest prairie *Papaipema* moths are active late in the evening (actually early morning hours) (Schweitzer 1999). Based on our blacklighting observations in southern Michigan, *beeriana* is active for a short period of time beginning around 2300 and ending near 2400 hours EST. Several factors need to be considered including ambient temperatures, humidity levels, precipitation, wind, and moon phase; all of which affect moth behavior. Major natural enemies of *Papaipema* include mammals such as rodents and skunks (Hessel 1954, Decker 1931, Schweitzer 1999), woodpeckers (Decker 1930) as well as numerous parasitoids and predatory insects. Small mammals in some cases can completely eradicate small populations (Hessel 1954). A tachinid fly, *Masicera senilis*, and a braconid wasp, *Apanteles papaipemae*, are probably the most important parasitoids of *Papaipema* (Decker 1930).

**Conservation/management:** Protection of known populations is essential to protect this species in Michigan. Almost all major workers on the genus have commented on the fire sensitivity of *Papaipema* eggs, and Decker (1930) highly recommends use of fire to control the pest species *P. nebris*. Land managers should heed Dana's (1986) general advice and always assume high mortality of *Papaipema* eggs in fall, winter, or spring burn units. To protect *Papaipema* populations, Schweitzer (1999) recommends protecting an adequate amount of the foodplant and to divide habitat into smaller burn units. No *Papaipema* site should ever be entirely burned in a single year. Foodplants spread over a large area or in several discrete patches reduce the risk from predators and parasitoids as compared to a comparable number of plants in a single dense patch. Most, if not all, of these parasitoids are native species and in most cases they do not need to be controlled. All known sites of *beeriana* on managed lands should be monitored periodically. There is no information to suggest how often this

should be done and likely these surveys will be at the level of presence/absence, either of larvae or adults. Schweitzer does believe one could quantitatively sample larvae (or at least larval burrows) to estimate the actual size of a population. Monitoring is especially critical when planning to implement prescribed burns. Keep in mind that distribution of the *Papaipema* population among the various burn units will probably vary from year to year, so current information is needed. Generally decisions will be made on information from the previous growing season, since this is the best information on the distribution of *P. beeriana* eggs within a site.

**Research needs:** Major research needs, as outlined by Schweitzer (1999), include information on habitat requirements other than foodplants, on conditions under which females disperse, and on presence or absence of *Papaipema* on prairie preserves and other fire managed habitats. The latter is needed before dormant season burn regimens are implemented. Any information on speed of recolonization after prescribed burns would be useful. It would be important to try and document how recovery occurred, i.e., from other burn units, from outside the managed area, from skips in the burn, or from very wet microhabitats. More actual information on survival of *Papaipema* in mid or late summer burns is needed. More precise information as to what date *Papaipema* larvae have moved below ground is needed. This information can be used to better time burns, conduct mowing, or schedule grazing rotations. Information is needed to determine whether adults can locate suitable places for oviposition in foodplant patches burned or grazed earlier in the same season. For example, can adults (which typically occur October 1) find places to lay eggs in habitats burned in July or August. Information on how high eggs are placed on the host plant is needed so that the potential suitability of mowing as a management option can be evaluated.

**Related abstracts:** lakeplain prairie, prairie fen, pine barrens, culver's root borer moth

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