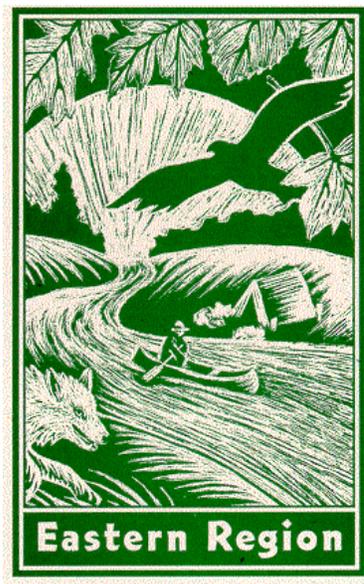


*Conservation Assessment*  
*For*  
*Blazing Star Stem Borer Moth (Papaipema beeriana)*



*USDA Forest Service, Eastern Region*  
2003

Prepared by:



*This Conservation Assessment was prepared to compile the published and unpublished information and serves as a Conservation Assessment for the Eastern Region of the Forest Service. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject community, please contact the Eastern Region of the Forest Service - Threatened and Endangered Species Program at 310 Wisconsin Avenue, Suite 580 Milwaukee, Wisconsin 53203.*

## Table of Contents

<b>NOMENCLATURE AND TAXONOMY .....</b>	<b>4</b>
<b>RANGE: .....</b>	<b>4</b>
<b>PHYSIOGRAPHIC DISTRIBUTION:.....</b>	<b>4</b>
<b>HABITAT: .....</b>	<b>4</b>
<b>SPECIES DESCRIPTION: .....</b>	<b>5</b>
<b>LIFE HISTORY:.....</b>	<b>5</b>
<b>NATURAL AND HUMAN LAND USE THREATS: .....</b>	<b>5</b>
<b>VIABILITY: .....</b>	<b>6</b>
<b>MANAGEMENT: .....</b>	<b>7</b>
<b>MONITORING:.....</b>	<b>8</b>
<b>RESEARCH NEEDS: .....</b>	<b>8</b>
<b>REFERENCE LIST:.....</b>	<b>9</b>

## NOMENCLATURE AND TAXONOMY

<b>Scientific Name:</b>	<i>Papaipema beeriana</i> Bird
<b>Common Name:</b>	Blazing Star Stem Borer Moth
<b>Family:</b>	Noctuidae (Noctuid Family)
<b>Synonyms:</b>	
<b>USFS Region 9 Status:</b>	Sensitive
<b>USFWS Status:</b>	No status
<b>Illinois Status:</b>	No status

**Global And State Rank:** The Nature Conservancy's Heritage Program ranks this species as G3. This ranking means *Papaipema beeriana* is rare and uncommon globally (Illinois Natural Heritage Database 1999). *Papaipema beeriana* is unranked by the Illinois Natural Heritage Program. *Papaipema beeriana* has been extirpated in much of its historic range and rare throughout its current range. Reasons for this decline are loss of prairie habitat. The populations vary from several large to most being fairly small. Most of the populations are isolated from other populations.

### RANGE:

Primarily Midwestern, formally probably throughout the tallgrass prairie where its larval food plant blazing star *Liatris spicata* were found. Figure 1 indicated the distribution of *Liatris spicata* in the United States. In Illinois, this species can be found in six counties: Cook, Du Page, Grundy, Iroquois, Lee and Will. The status of this species in areas west of Illinois is relatively unknown. Figure 2 indicates the distribution of *Papaipema beeriana* in Illinois by county.

### PHYSIOGRAPHIC DISTRIBUTION:

In Illinois *Papaipema beeriana* is currently known from the Central Till Plains Section of the Prairie Parklands Province and the Southwestern Great Lakes Morrainal Section of the Eastern Broadleaf Forest Province (Keyes et. al. 1995). *Papaipema beeriana* occurs in the Grand Prairie and Northeastern Morainal Natural Divisions of Illinois (Schwegman et. al. 1973).

### HABITAT:

Wet and wet-mesic prairie. In Illinois, *Papaipema beeriana* is associated with moderately disturbed to relatively undisturbed prairie.

## **SPECIES DESCRIPTION:**

Members of the noctuid genus *Papaipema* have simple antennae and are characterized by a long thoracic tuft (except in *cerina*) that often slants forward and is truncate at the distal end (Panzer and Bess 1997). *Papaipema* larvae, nearly all of which are purplish brown in color, have a pattern of longitudinal white stripes and can be placed into one of four groups based on stripe configurations within the thoracic region (Panzer and Bell 1997). Unlike other *Papaipema* larvae, *P. beeriana* larvae do not have a pattern of longitudinal white stripes. This species is somewhat orange in color, and does not resemble any other *Liatrix* root borers.

Adult *P. maritima* and *P. necopina* are very similar to *P. beeriana*. However, *P. beeriana* can be distinguished (with difficulty) from similar species by the presence of a brown midsection on their otherwise gray forewings.

## **LIFE HISTORY:**

*Papaipema beeriana* larvae rely on blazing stars (*Liatrix* spp.) as its requisite host plant. Marsh blazing star (*Liatrix spicata*) is the preferred host species. *Liatrix aspera* isn't used and it's unknown if *Liatrix pycnostachya* is used. Blazing star is it's only known larval host, although other *Papaipema* moths have been known to utilize blazing star.

The following account is based on Panzer and Bess (1997) for *Papaipema silphii*, but is the same for *Papaipema beeriana*. *Papaipema beeriana* is univoltine in Illinois, with adults on the wing from late August through early October. Mating and egg laying are strictly nocturnal. Females deposit 200 or more eggs within the duff on or near requisite host plants. Larvae emerge from overwintered eggs in late May and immediately begin to bore into their host plants. Larvae enter stems near the ground and slowly eat their way into the root of the plant. Feeding continues through early August, at which time mature larvae cease all activity and lay dormant for approximately one week. Larvae pupate in late August, either in the root or in the soil, and emerge as adults roughly 18-21 days later.

*Papaipema beeriana* is not a long-distance colonizer, and colonization may be an issue with this species (Panzer pers. com.).

## **NATURAL AND HUMAN LAND USE THREATS:**

Since *Papaipema beeriana* is host specific to blazing star it is dependant upon the survival of it's host plant. Blazing star although a common prairie plant, rarely grows in disturbed conditions and is restricted to high quality relatively undisturbed prairies. Since high quality prairie remnants are rare, habitat for *Papaipema beeriana* is somewhat restricted. Blazing star grows well in prairie reconstructions and existing habitat may be augmented by planting prairie in former croplands.

Predation may have an impact on *Papaipema beeriana*, the following account is taken directly from Panzer and Bess (1997). *Papaipema* larvae are preyed upon by a variety of organisms. Losses to endoparasitic wasps can be extensive, with entire populations wiped out within specific host plant patches (Wyatt 1942). Adult moths are cryptically colored, move about very little, are present late in the year when most predator species are no longer present, and likely experience only slight levels of predation. It is quite likely that egg and larval mortality accounts for the bulk of the losses to predation for this species. Sources of larval mortality are numerous, and can include larger predators such as skunks, mice, and muskrats (Bird 1934).

Other *Papaipema* species rarely use the same host plant as *P. beeriana*, so competition may not be a factor in this stem borer.

Because *Papaipema beeriana* over winters in the duff it can be susceptible to fire (prescribed burns). This could especially be a problem if most or all the blazing star habitat within a natural area is burned. Panzer (pers. com.) notes that fire should not be a problem as long as the entire blazing star habitat is not burned all at once. However, Panzer and Bess (1997) believe that long-term fire suppression and the resultant loss of prairie habitat that can occur may represent the greatest threat to the species.

Although the impact of grazing on *Papaipema* species is unknown, Panzer and Bess (1997) mentioned it as a possible threat if grazing is heavy during October through May. Goose Lake Prairie State Park in Illinois was heavily grazed at one time and they survived. Apparently they can survive a long bout of grazing on large sites. Grazing maybe acceptable as long as *L. spicata* survives.

There is speculation that trampling could be a problem (Ron Panzer pers. com.). Females mate in late fall (Sept.) and deposit their eggs around the host plant. Studies have shown that insect eggs buried one centimeter deep are not subject to trampling issues. However, since these eggs simply fall to the ground right around the host plant, they are susceptible. They may also be particularly vulnerable to trampling in the spring, for larvae emerge from overwintered eggs in late May.

After June 15, the insects have moved to the ground, so mowing may have no direct impacts to the population at this time (Ron Panzer pers. com.). However, in the spring, mowing may destroy larvae before they have enough time to enter the roots of the host plants. Indeed, mowing at this time maybe worse than grazing or trampling.

## **VIABILITY:**

The overall goal is to maintain a viable population of *Papaipema beeriana* throughout appropriate habitat. Soule (1980) suggested that minimum viable populations are the smallest size that can persist over a period of years (usually 100 is used) with a low extinction probability (less than 5%) and with enough genetic diversity to adapt to changing conditions in the environment. Good population information doesn't exist for the few sites currently known to have *Papaipema beeriana*. Until population data is available it's impossible to

determine a minimum population size. In the mean time the following specific goals would increase the likelihood of maintaining a viable population:

1. Maintain and increase the existing population of *Papaipema beeriana* by improving the current habitat. This habitat has to be improved and protected through proper management.
2. Reintroduce populations into patches of blazing star (> 100 plants scattered over at least one acre) as restoration proceeds. Blazing star is a common prairie forb and will be planted as prairie restoration and reconstruction proceeds. This will provide habitat for *Papaipema beeriana*. Disjunct populations of blazing star may need *Papaipema beeriana* reintroduction efforts.

## **MANAGEMENT:**

1) Maintain and increase the existing population of *Papaipema beeriana* by improving the current habitat through the following management practices:

- a) Prescribed burning should be initiated in the current habitat to control woody plant encroachment. Since *Papaipema beeriana* overwinters in the duff, they are sensitive to fire. Only a portion of the existing habitat (no more than 1/3) should be burned at any particular time. Unburnt areas are necessary to serve as refugia for recolonization by *Papaipema beeriana* into burned areas.
- b) Mowing is another method that could be used to control woody vegetation. Little is known about the impacts of mowing on *Papaipema* species and until the impacts are known this management tool should only be used conservatively.
- c) Exotic species encroachment into the current habitat should be controlled using methods (including herbicides if appropriate) as outlined by an integrated pest management plan such as Carroll and White (1997). Care should be taken to minimize impact to *Papaipema beeriana* host plants, blazing stars.
- d) Control of woody plant species too large to be controlled by prescribed fire should be removed. Either the woody plants can be girdled and left in place to slowly decompose or cut off and removed during the dormant season. All cut surfaces should be treated with a herbicide to prevent resprouting. Care should be taken to minimize impact to *Papaipema beeriana* host plants, blazing stars.
- e) Recreational activities that would disturb the newly restored populations should be avoided in the short term. Recreational activities that allow the introduction of exotic species should be avoided.
- f) Development of trails within areas where the host plant, *Liatris spicata* is being restored should be minimized to prevent any harm to the population until the

population of *Liatris spicata* is quite large, in the thousands.

2. Reintroduce populations into patches of *Liatris spicata* as restoration proceeds. Blazing star is a common prairie forb and will be a common prairie forb planted as prairie restoration and reconstruction proceeds. This will provide habitat for *Papaipema beeriana*. Both *Papaipema beeriana* and *Liatris spicata* should be managed for by the following practices:

a) *Liatris spicata* is a common prairie forb and will be a major component of any wet-mesic to dry prairie reconstruction seed mix. *Liatris spicata* is a prairie forb that is also quite common in late successional prairie. For these reasons as restoration proceeds thousands to hundred of thousands of host blazing star plants will probably be available for *Papaipema beeriana*. *Papaipema beeriana* should colonize newly established blazing star plants from existing ones if the distance between them isn't too great.

b) Reintroduction of *Papaipema beeriana* to more disjunct populations of blazing star may be necessary. Any reintroductions should be done with adults from nearby populations.

3. General management practices should include”

a) Once good populations of *Papaipema beeriana* have been established and there are thousands of blazing star plants, little specific management will be necessary other than normal prairie management. Periodic prescribed burning will be necessary to control woody plant encroachment and to stimulate the prairie. Burning should be done on a rotation and in units to provide unburned areas for recolonization into burned areas by *Papaipema beeriana*. No more than 1/3 should be burned in a year. Exotic species should be controlled in any prairie reconstruction or restoration. No specific recreational activities will be prohibited other than those general ones necessary to protect the prairie habitat.

b) Collecting of *Papaipema beeriana* will be prohibited except for scientific purposes and only with a permit.

## **MONITORING:**

A monitoring protocol will be set up to locate subpopulations of *Papaipema beeriana* and to monitor the health of select subpopulations. This is best done searching for the larval entry holes and associated frass on the host plants. Detecting the presence of the species is straightforward, but measuring populations is more difficult and good techniques haven't been developed.

## **RESEARCH NEEDS:**

1) The colonization through space and time of *Papaipema beeriana* to new areas

should be researched to determine recolonization potential.

- 2) Research is needed on population genetics, including studies of such topics as gene flow and diversity. Population genetics of this species are unknown.
- 3) Research is needed on the effects of grazing and mowing on this species.
- 4) Research is needed on the differential effects of spring vs fall burns.
- 5) Sampling techniques need to be developed so that populations of this species can be measured more easily.

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## FIGURES

Figure 1. U.S. Distribution of *Liatris spicata*

Figure 2. Illinois Distribution of *Papaipema beeriana* By County