Preliminary findings from a survey of endophagous insects in plant stems and stemlike structures from the Upper Midwest, USA

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INTRODUCTION

This report is my initial cursory attempt to publish more fully the findings from my ongoing, multi-year survey of endophagous insects that feed inside stems and stemlike structures of plants in the Upper Midwest, USA. A website (https://insect-pages.github.io) is in progress to share the survey findings in a more accessible format, but personal issues are slowing progress there and so I have felt it desirable to publish what I can now in this document. I hope that much more will be forthcoming.

By "endophagous insect" I refer to the definition of endophagy in Tooker and Giron (2020). Endophagous insects counted in the survey include any that conduct significant feeding internally in a living plant stem, rachis, peduncle, pedicel, thorn, rhizome, petiole, midrib, or major lateral leaf vein. This includes insects whose initial feeding occurs in the living plant but who complete their development in senescent plant tissue. I have generally excluded saprophages who feed only in dead or decaying plant matter. With a few exceptions, I have also mostly excluded cerambycid, buprestid, and larger lepidopteran borers in woody plants, in favor of focusing on the lesser-known fauna in plant stems, especially herbaceous stems.

All insects were directly observed by me in the Upper Midwest states of Iowa, Minnesota, and/or Wisconsin, mostly between 2010 and 2026. In many cases, my efforts to rear larvae resulted in pupae and/or adults. For nearly every record listed herein, I took photographs of the insect's life stages (including any reared stages) and plant damage and recorded written notes about the same. I am in the process of converting the notes into written descriptions for each insect-plant association, and most such descriptions so far prepared are published in this document. I am also preparing the photos for publication on the aforementioned website, where a selection may already be found.

I group endophagous insects from stems and stemlike structures into three broad feeding modes -- stem borers, stem miners, and local feeders -- along with a few intermediate categories, and propose the following working definitions.

- **Local feeding** in a plant stem is feeding by an endophagous insect that occurs in a single highly localized and self-contained region within the stem, the region usually less than 1 inch (~25mm) in length and lacking significant directional excavation along the long axis of the stem.
- **Stem boring** is feeding by an endophagous insect that involves significant directional excavation within the interior or core of the stem, the excavated area usually greater than 1 inch (~25mm) in length.
- **Stem mining** is feeding by an endophagous insect that involves externally visible, shallow excavation through one or more outer layers of stem tissue.
- A **stem borer** is an endophagous insect whose feeding activity mostly or entirely involves stem boring.
- A **stem miner** is an endophagous insect whose feeding activity mostly or entirely involves stem mining.
- A **local feeder** is an endophagous insect whose feeding activity mostly or entirely involves local feeding.
- A **stem miner/borer** is an endophagous insect whose feeding activity includes a significant amount of both stem mining and stem boring, generally starting with stem mining and then progressing to stem boring as the insect grows, or whose feeding activity is intermediate between stem mining and stem boring.
- A **local feeder/borer** in a plant stem is an endophagous insect whose feeding activity includes characteristics of both stem boring and local feeding.

I have been using the term "local feeder" in my private recordkeeping for several years now. It is intended to encompass insects traditionally called "gallmakers", as well as those who can be observed to feed without much excavation in a highly localized region even if it is unclear whether the plant tissue has been modified into a true gall. The idea is to free us (or myself, at least) from the need to define localized feeding based primarily on the

physiological modification of the plant tissue, since, in some cases, the details of such modification may only be clearly discernible with high-powered equipment inaccessible to many people. It is beyond the scope of this brief introduction (and my limited knowledge) to consider the topic at greater length in this report, but for a recent discussion on inconspicuous or cryptic galls and related terminology, see Davis et al. (2026).

A REQUEST

I hope you will find this information useful and engaging.

If the information here ends up inspiring or informing your own investigations, please get in touch to tell me about it! If you end up publishing your work that was informed or inspired at least in part by this document (for example, your studies of an insect you found out about through this document), I'm asking for an honest and clear public acknowledgment of the role this document played in your efforts, preferably contained in your published work itself. Even if you're simply publishing on iNaturalist, or a blog post, or something like that, I'm requesting a few words of acknowledgment in the event that my work was somehow significantly involved (directly or indirectly) in helping bring yours to life.

For example, if you're posting on iNaturalist about an insect you first found out about through this document, you could write something like, "J. van der Linden clued me into this plant-insect association via his publication at https://insect-pages.github.io", and put that sentence in the Notes section of the observation, or in an acknowledgments section published elsewhere that you link to from somewhere in the post. If you're unsure how to meet this request, please feel free to get in touch (iNaturalist @j_vanderlinden) -- I'm happy to negotiate specifics.

If the text of such a work of yours refers directly to information gathered from this document, please cite the source using a standard citation format, such as the following:

Van der Linden, J. 2026. Preliminary findings from a survey of endophagous insects in plant stems and stemlike structures from the Upper Midwest, USA. In Some endophagous insects from the Upper Midwest, USA. Self-published Web reference. Retrieved [date] from https://insect-pages.github.io.

If you are an administrator of or contributor to a website or similar compilation that aggregates biological information from various sources, and you wish to include information from this document in your project, I ask that you contact me to tell me about what you plan to do, even if you do not plan to reproduce text verbatim.

LIST OF RECORDS

This list is organized by host plant genus.

The number at the start of the record (e.g, "#0010.") is a four-digit number, unique to each record, which I designated to help streamline recordkeeping.

The phrase immediately following the record number (e.g., "Stem borer.") indicates the feeding mode I have observed for the insect, as defined in the Introduction, above.

Following that is the taxonomic information for the insect, if known. In many cases an insect has not yet been identified to species, but appears similar to a known taxon. In these cases I have used "cf." to indicate the insect should be compared to the known taxon.

The following abbreviations are used in square brackets to indicate the life stages I have observed for each insect record.

T: Trace; tunnel, mine, gall, or other damage to plant / feeding sign
E: Egg / Oviposition area in plant
L: Larva
P: Pupa / Puparium
A: Adult (reared, unless otherwise noted)

Abbreviations in parentheses () at the end of a record, e.g. "(th)", indicate the host plant species in which I observed the insect, with the abbreviations expanded into the Latin species names at the end of each host plant genus entry.

Written descriptions of some of these records may be found in the "Text Descriptions of Records" section, below.

###

Abutilon (Malvaceae)

#0653. Stem borer. Order and family undetermined [T]. (th)
#0001. Stem miner. Diptera: Agromyzidae: *Ophiomyia abutilivora* [T,P,A]. (th)

___
th - *A. theophrasti* (buttonweed)

Acalypha (Euphorbiaceae)

#0770. Local feeder in petiole. Diptera: Cecidomyiidae: *Resseliella globosa* [T,L]. (rh)

___
rh - *A. rhomboidea* (three-seeded mercury)

Acer (Sapindaceae)

#0007. Stem borer. Lepidoptera: Nepticulidae: cf. *Etainia ochrefasciella* [T,L,P,A]. (su)
#0002, 0005. Stem borer. Lepidoptera: Tortricidae: cf. *Proteoteras* sp. [T,L,P,A]. (nd, si)
#0779. Stem miner. Lepidoptera: Gracillariidae: *Marmara* sp. [T]. (nd)
#0006. Petiole borer. Hymenoptera: Tenthredinidae: *Caulocampus* cf. *acericaulis* [T,L]. (su)
#0003. Local feeder in midrib. Diptera: Cecidomyiidae: cf. *Contarinia negundinis* [T]. (nd)
#0641. Local feeder in petiole. Order and family unknown [T]. (si)
#0643. Local feeder in petiole. Diptera: Cecidomyiidae: cf. *Neolasioptera* [T]. (si)

___
nd - *A. negundo* (boxelder)
si - *A. saccharinum* (silver maple)
su - *A. saccharum* (sugar maple)

Achillea (Asteraceae)

#0010. Stem borer. Coleoptera: Erotylidae: Erotylinae: Languriini: cf. *Acropteroxys gracilis* [T,L,A]. (mi)
#0011. Stem borer. Coleoptera: Mordellidae [T,L,P,A]. (mi)
#0008. Stem borer; borer in petiole and plant crown. Diptera: Agromyzidae: *Melanagromyza virens* (+1 addl. sp.?) [T,P,A]. (mi)
#0009. Miner in leaf midrib. Diptera: Agromyzidae: *Liriomyza* sp. [T]. (mi)

___
mi - *A. millefolium* (yarrow)

Actaea (Ranunculaceae)

#0012. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P,A]. (sp)
#0013. Stem miner. Lepidoptera: Gracillariidae: cf. *Marmara* sp. [T]. (sp)

___
sp - undetermined *A.* sp. (baneberry)

Aegopodium (Apiaceae)

#0734. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (po)

___
po - *A. podagraria* (goutweed)

Aesculus (Sapindaceae)

#0014. Petiole borer. Lepidoptera: Tortricidae: *Zeiraphera claypoleana* [T,L,P,A]. (gl)

___
gl - *A. glabra* (Ohio buckeye)

Agastache (Lamiaceae)

#0015. Stem miner. Lepidoptera: Opostegidae: *Pseudopostega* sp. [T,P,A]. (np)
#0016. Stem borer. Coleoptera: Mordellidae: cf. *Mordellina pustulata* [T,L,A]. (sp)
#0017. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P]. (sp)
#0018. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (sp)

___
np - *A. nepetoides* (yellow giant hyssop)
sp - undetermined *A.* sp. (giant hyssop)

Ageratina (Asteraceae)

#0675. Stem borer. Coleoptera: Cerambycidae: *Hippopsis lemniscata* [T,L,A]. (al)
#0019. Stem borer. Coleoptera: Cerambycidae: *Oberea tripunctata* [T,P,A]. (al)
#0701. Stem borer. Coleoptera: Curculionidae: Scolytinae [T,A]. (al)
#0020. Stem borer. Coleoptera: Erotylidae: Languriini: cf. *Acropteroxys gracilis* [T,L]. (al)
#0021. Stem borer. Coleoptera: Mordellidae [T,L,P,A]. (al)
#0727. Stem borer. Coleoptera: Mordellidae: cf. *Mordellina pustulata* [T,P,A]. (al)
#0030, 0031. Stem borer. Diptera: Agromyzidae [T,L,P]. (al)
#0029. Stem borer. Diptera: Tephritidae: cf. *Strauzia rugosum* [T,P]. (al)
#0027. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (al)
#0025. Stem borer. Lepidoptera: Tortricidae: Cochylini: cf. *Aethes angustana* sp. grp. [T,L,A]. (al)
#0028. Stem borer. Lepidoptera: Tortricidae: Cochylini: cf. *Cochylichroa avita* [T,L,P,A]. (al)
#0026. Stem miner. Lepidoptera: ?Gracillariidae [T]. (al)
#0632. Local feeder in stem. Diptera: Cecidomyiidae: *Asphondylia eupatorii* [T]. (al)
#0022. Local feeder in petiole and stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. (+?) [T,L,P,A]. (al)
#0032. Local feeder in stem. Diptera: Cecidomyiidae: *Resseliella* sp. [T,L]. (al)
#0024. Local feeder in stem. Diptera: Tephritidae: *Eutreta* sp. [T,P,A]. (al)
#0023. Local feeder in stem. Hymenoptera: Eurytomidae [T,L,A]. (al)

___
al - *A. altissima* (white snakeroot)

Agrostis (Poaceae)

#0650. Stem borer. Diptera: Dolichopodidae: *Thrypticus* sp. [T,L]. (sp)

___
sp - undetermined *A.* sp. (bentgrass)

Alliaria (Brassicaceae)

#0033. Stem borer. Coleoptera: cf. Curculionoidea [T,L]. (pt)
#0034. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,L,P,A]. (pt)
#0798. Stem miner. Diptera: Agromyzidae: *Liriomyza* sp. [T,L]. (pt)
#0035. Stem miner. Lepidoptera: Gracillariidae: cf. *Marmara* sp. [T,L]. (pt)
#0036. Stem borer. Coleoptera: Mordellidae [T,L]. (pt)

___
pt - *A. petiolata* (garlic mustard)

Amaranthus (Amaranthaceae)

#0625. Stem borer. Diptera: Agromyzidae [T,L,P]. (re)

___
re - *A. retroflexus* (pigweed)

Ambrosia (Asteraceae)

#0660. Stem borer. Coleoptera: Curculionoidea: cf. Brentidae: *Fallapion* [L]. (tr)
#0636. Stem borer. Coleoptera: Erotylidae: Erotylinae: Languriini [T,L]. (tr)
#0045. Stem borer. Coleoptera: Mordellidae [T,L,A]. (tr)
#0040. Stem borer. Diptera: Agromyzidae: *Melanagromyza* [T,L,P,A]. (tr)
#0037, 0039. Stem borer. Diptera: Tephritidae: cf. *Strauzia perfecta* [T,L]. (ar, tr)
#0043. Stem borer. Lepidoptera: Noctuidae: *Papaipema* cf. *nebris* [T,L,A]. (tr)
#0038. Stem borer. Lepidoptera: Tortricidae: Epiblema sp. [T,L,P,A]. (ar)
#0042. Local feeder in stem. Diptera: Tephritidae: *Procecidochares gibba* [T,L,P,A]. (tr)
#0667. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Resseliella* sp. [T,L]. (tr)

#0041. Local feeder in rachis. Coleoptera [T,L]. (tr)

___
ar - *A. artemisiifolia* (common ragweed)
tr - *A. trifida* (giant ragweed)

Amorpha (Fabaceae)

#0047, 0705. Local feeder in stem. Lepidoptera: Cosmopterigidae: *Walshia amorphella* [T]. (ca, fr)
#0046, 0706. Local feeder in leaf rachis (and stem?). Diptera: Cecidomyiidae: Cecidomyiidi [T,L]. (ca, fr)

___
ca - *A. canescens* (leadplant)
fr - *A. fruticosa* (indigo bush)

Amphicarpaea (Fabaceae)

#0048. Stem borer. Diptera: Drosophilidae: *Stegana vittata* [T,L,P,A]. (br)

___
br - *A. bracteata* (American hog peanut)

Andropogon (Poaceae)

#0049. Stem borer. Coleoptera: Tenebrionidae: *Statira* sp. [T,L]. (ge)
#0053. Stem borer. Diptera: Dolichopodidae: *Thrypticus* sp. [T,L,P,A]. (ge)
#0054. Stem borer. Lepidoptera [T,L]. (ge)
#0051. Local feeder in stem. Diptera: Cecidomyiidae [T,L]. (ge)
#0052. Internal feeder in stem. Diptera: Chloropidae [T,P,A]. (ge)

___
ge - *A. gerardii* (big bluestem)

Anemone (Ranunculaceae)

#0057. Stem borer. Coleoptera: Mordellidae [T,L,P]. (sp)
#0058. Stem borer, with initial mining. Diptera: Agromyzidae: Phytomyzinae: cf. *Phytomyza* [T,L,P]. (sp)
#0055. Petiole miner/borer; leaf blade miner; apparent root miner/borer. Diptera: Agromyzidae [T]. (ac)
#0056, 0059. Local feeder in petiole. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L]. (ac, sp)

___
ac - *A. acutiloba* (sharp-leaved hepatica)
cy - *A. cylindrica* (thimbleweed)
vi - *A. virginiana* (tall thimbleweed)
sp - undetermined *A.* sp. (thimbleweed), either *A. cylindrica* (thimbleweed) or *A. virginiana* (tall thimbleweed) or both

Angelica (Apiaceae)

#0061. Stem borer. Diptera: Agromyzidae: *Melanagromyza angelicae* [T,P,A]. (at)
#0060. Petiole borer. Coleoptera: Brentidae: Apioninae: *Fallapion* sp. [T,L,P,A]. (at)

___
at - *A. atropurpurea* (angelica)

Apios (Fabaceae)

#0062. Stem borer. Diptera: Agromyzidae [T,L,P,A]. (am)
#0063. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Neolasioptera* sp. [T,L,P,A]. (am)

___
am - *A. americana* (groundnut)

Apocynum (Apocynaceae)

#0064. Stem miner. Diptera: Agromyzidae: Agromyzinae [T,L,P]. (cb)

___

cb - *A. cannabinum* (Indian hemp)

Aquilegia (Ranunculaceae)

#0067. Stem borer. Coleoptera: Mordellidae: *Mordellistena* sp. [T,L,A]. (ca)
#0065. Stem miner. Diptera: Agromyzidae: cf. *Ophiomyia* sp. [T,L,P]. (ca)
#0066. Stem and basal-leaf petiole borer. Diptera: cf. Agromyzidae [T,L]. (ca)

___
ca - *A. canadensis* (red columbine)

Arabidopsis (Brassicaceae)

#0068. Stem miner. Diptera: Agromyzidae: ?Phytomyzinae [T]. (ly)

___
ly - *A. lyrata* (lyre-leaved rockcress)

Aralia (Araliaceae)

#0071. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P,A]. (ra)
#0069. Petiole borer. Coleoptera: Mordellidae: cf. *Mordellistena* sp. [T,L,A]. (nu)
#0070. Petiole miner, probable rhizome miner. Diptera: Agromyzidae: cf. *Ophiomyia* sp. [T,L,P]. (nu)

___
nu - *A. nudicaulis* (wild sarsaparilla)
ra - *A. racemosa* (spikenard)

Arctium (Asteraceae)

#0073. Stem miner, petiole miner. Lepidoptera: Gracillariidae: cf. *Marmara* sp. [T]. (mi)
#0072. Petiole borer. Diptera: Agromyzidae: *Phytomyza* sp. [T,L,P,A]. (mi)
#0074. Local feeder in stem. Diptera: Cecidomyiidae [L]. (mi)

___
mi - *A. minus* (burdock)

Arnoglossum (Asteraceae)

#0075, 0078. Stem borer. Diptera: Agromyzidae: *Melanagromyza arnoglossi* [T,L,P,A]. (pl, re)
#0080. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (pl)
#0077. Stem borer. Lepidoptera: Tortricidae: cf. Cochylini [T,L,P,A]. (re)
#0076, 0079. Stem miner, petiole miner. Lepidoptera: Gracillariidae: *Marmara* sp. [T,L,P,A]. (pl, re)
#0686. Petiole miner/borer. Diptera: Agromyzidae: cf. *Melanagromyza* sp. [T,P]. (re)
#0778. Local feeder in petiole. Diptera: Cecidomyiidae: cf. Neolasioptera [T]. (re)

___
pl - *A. plantagineum* (prairie indian-plantain)
re - *A. reniforme* (great indian-plantain)

Artemisia (Asteraceae)

#0754. Stem borer. Coleoptera: Mordellidae [T,L]. (lu)
#0081. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L,P,A]. (ca)
#0082. Stem borer; local feeder in stem. Lepidoptera: Tortricidae: *Epiblema benignatum* [T,L,P,A]. (lu)
#0717. Internal feeder in stem. Undetermined [T]. (sp)

___
ca - *A. campestris* (wormwood)
lu - *A. ludoviciana* (white sage)
sp - undetermined *A.* sp., either *A. campestris* or *A. dracunculus*

Asarum (Aristolochiaceae)

#0083. Local feeder in rhizome. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L]. (ca)

___
ca - *A. canadense* (wild ginger)

Asclepias (Apocynaceae)

#0084, 0087. Stem borer. Coleoptera: Curculionidae: *Rhyssomatus* sp. [T]. (am, sy)
#0085. Stem miner. Order and family undetermined [T]. (in)
#0086. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Neolasioptera* sp. [T,L]. (in)

___
am - *A. amplexicaulis* (clasping milkweed)
in - *A. incarnata* (swamp milkweed)
sy - *A. syriaca* (common milkweed)

Asparagus (Asparagaceae)

#0634. Stem miner. Diptera: Agromyzidae: *Ophiomya simplex* [T,P]. (of)

___
of - *A. officinalis* (asparagus)

Baptisia (Fabaceae)

#0088. Stem borer. Coleoptera: Mordellidae: Mordellistenini [T,L,A]. (br)

___
br - *B. bracteata* (cream wild indigo)

Barbarea (Brassicaceae)

#0089. Miner/borer in petiole and stem. Coleoptera: Chrysomelidae: Galerucinae: Alticini: *Psylliodes* sp. [T,L,A]. (vr)
#0090. Midrib miner. Diptera: Drosophilidae: cf. *Scaptomyza flava* [T,A]. (vr)
#0738. Stem miner. Diptera: Agromyzidae: *Ophiomyia* [T,P]. (vr)

___
vr - *B. vulgaris* (yellow rocket)

Berteroa (Brassicaceae)

#0091. Stem borer. Order and family undetermined [T]. (in)
#0092. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (in)

___
in - *B. incana* (hoary alyssum)

Betula (Betulaceae)

#0093. Local feeder in petiole. Diptera: Cecidomyiidae: cf. *Apagodiplosis papyriferae* [T,L]. (pp)

___
pp - *B. papyrifera* (paper birch)

Bidens (Asteraceae)

#0095. Stem borer. Coleoptera: Curculionoidea [T,A]. (sp)
#0094. Stem borer. Coleoptera: Curculionidae: *Conotrachelus geminatus* [T,L,A]. (sp)
#0796. Stem borer. Coleoptera: Curculionidae: cf. Baridinae [T,A]. (sp)
#0096. Stem borer. Lepidoptera: ?Tortricidae: cf. *Epiblema otiosana* [T,L]. (sp)
#0792. Local feeder in stem. Diptera: Cecidomyiidae: *Asphondylia* sp. [T]. (sp)

___
sp - undetermined *B.* sp. (beggarticks)

Blephilia (Lamiaceae)

#0098. Stem borer. Coleoptera: Cerambycidae: *Oberea* sp. [E,A]. (hi)
#0739. Stem borer. Coleoptera: Erotylidae: *Acropteroxys gracilis* [T,L,A]. (hi)
#0099. Stem borer. Coleoptera: Mordellidae: cf. *Mordellina pustulata* [T,L,A]. (hi)
#0100. Stem borer. Diptera: Agromyzidae: *Melanagromyza blephiliae* [T,P,A]. (hi)
#0103. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L,P]. (hi)

#0101. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (hi)
#0097. Stem miner, localized stem borer. Lepidoptera: Opostegidae: *Pseudopostega* sp. [T,L,P,A]. (hi)
#0102. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L]. (hi)

___
hi - *B. hirsuta* (hairy woodmint)

Boechera (Brassicaceae)

#0106. Stem borer. Coleoptera [T,L]. (dt)
#0104. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P]. (ca)
#0105. Midrib and petiole miner; leaf blade miner. Diptera: Drosophilidae: *Scaptomyza flava* [T,L,P,A]. (dt)

___
ca - *B. canadensis* (sickle-pod)
dt - *B. dentata* (toothed rock cress)

Bouteloua (Poaceae)

#0107. Local feeder in stem. Hymenoptera: ?Eurytomidae: cf. *Tetramesa* sp. [T,L,A]. (ct)

___
ct - *B. curtipendula* (sideoats grama)

Brassica (Brassicaceae)

#0108. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,L,P]. (na)

___
na - *B. nigra* (black mustard)

Bromus (Poaceae)

#0109. Stem borer. Coleoptera: Mordellidae [T,L,A]. (in)

___
in - *B. ?inermis* (smooth brome)

Calamagrostis (Poaceae)

#0767. Stem borer. Coleoptera: Mordellidae [T,L]. (ac)

___
ac - *C. × acutiflora* (feather reed grass)

Caltha (Ranunculaceae)

#0110. Petiole miner/borer. cf. Diptera: Sciaridae: *Zygoneura calthella* [T]. (pa)

___
pa - *C. palustris* (marsh marigold)

Calystegia (Convolvulaceae)

#0111. Stem borer. Coleoptera: Mordellidae [T,L]. (se)
#0112. Petiole borer. Diptera: Agromyzidae [L,P]. (se)
#0113. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera convolvuli* [T,L]. (se)

___
se - *C. sepium* (hedge bindweed)

Campanula (Campanulaceae)

#0114. Stem miner. Diptera: Agromyzidae: Phytomyzinae: cf. *Liriomyza* sp. [T,L,P]. (ro)
#0115. Local feeder in stem. Hymenoptera: Eurytomidae: cf. *Eurytoma* sp. [T,L,A]. (ro)

___
ro - *C. rotundifolia* (harebell)

Campanulastrum (Campanulaceae)

#0121. Stem borer. Coleoptera: Mordellidae [T,L]. (am)
#0120. Stem borer. Lepidoptera: Tortricidae: cf. *Paralobesia* [T,L,A]. (am)
#0116. Stem miner; midrib and petiole miner. Diptera: Agromyzidae: Phytomyzinae: cf. *Liriomyza* sp. [T,P]. (am)
#0117. Miner in stem and petiole. Diptera: Agromyzidae: *Ophiomyia* sp. [T,L,P]. (am)
#0119. Stem miner. Lepidoptera: Gracillariidae: cf. *Marmara* sp. [T,L]. (am)

___
am - *C. americanum* (American bellflower)

Cannabis (Cannabaceae)

#0122. Local feeder in stem; stem borer(?). Lepidoptera: Tortricidae: *Grapholita delineana* [T,L]. (sp)

___
sp - undetermined *C.* sp. (hemp/marijuana)

Capsella (Brassicaceae)

#0123. Miner/borer in petiole and stem. Coleoptera: Curculionidae: cf. *Ceutorhynchus* sp. [T,L,A]. (bu)

___
bu - *C. bursa-pastoris* (shepherd's purse)

Cardamine (Brassicaceae)

#0125. Midrib and petiole miner. Coleoptera: ?Chrysomelidae: cf. *Phyllotreta liebecki* [T,L]. (pv)
#0124. Miner in petiole and leaf blade. Diptera: Drosophilidae: *Scaptomyza* sp. [T]. (bu)

___
bu - *C. bulbosa* (spring cress)
pv - *C. pensylvanica* (Pennsylvania bittercress)

Carex (Cyperaceae)

#0127. Stem borer. Diptera: Agromyzidae [T,P,A]. (s2)
#0126. Miner/borer in pseudoculm. Diptera: Chloropidae: Chloropinae [T,L]. (s1)
#0748. Local feeder in culm. Diptera: Cecidomyiidae [T,L]. (s2)

___
s1 - *C.* sp., woodland sedge #1
s2 - *C.* sp., woodland sedge #2

Carya (Juglandaceae)

#0129. Stem borer. Coleoptera/Lepidoptera [T,L]. (sp)
#0130. Local feeder in leaf midrib and rachis. Hemiptera: Phylloxeridae: cf. *Phylloxera caryaecaulis* [T,L]. (sp)
#0722. Local feeder in rachis. Hemiptera: Phylloxeridae: cf. *Phylloxera subelliptica* [T]. (sp)

___
sp - undetermined *C.* sp. (hickory)

Caulophyllum (Berberidaceae)

#0132. Stem borer. Coleoptera: Mordellidae [T,L,A]. (th)
#0133. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Neolasioptera* sp. [T,L,P]. (th)

___
th - *C. thalictroides* (blue cohosh)

Ceanothus (Rhamnaceae)

#0134. Local feeder in stem. Lepidoptera: Cosmopterigidae: *Periploca ceanothiella* [T]. (sp)

___
sp - undetermined *C.* sp., either *C. americanus* or *C. herbaceus* (redroot / New Jersea tea)

Celastrus (Celastraceae)

#0135. Stem miner. Lepidoptera(?) [T]. (sc)

___
sc - *C. scandens* (American bittersweet)

Celtis (Cannabaceae)

#0136. Local feeder in stem. Diptera: Agromyzidae: *Agromyza deserta* [T,L]. (oc)
#0137. Local feeder in stem. Diptera: Cecidomyiidae [T,L]. (oc)
#0742. Local feeder in stem. Undetermined [T]. (oc)
#0138. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Celticecis celtiphyllia* [T,L]. (oc)
#0684. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Celticecis ovata* [T,L]. (oc)
#0688. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Celticecis expulsa* [T,L]. (oc)
#0649. Local feeder in stem. Hemiptera: Psyllidae: cf. *Pachypsylla* sp. [T,L]. (oc)
#0788. Local feeder in stem. Hemiptera: Psyllidae: *Pachypsylla venusta* [T,L]. (oc)

___
oc - *C. occidentalis* (hackberry)

Chaiturus (Lamiaceae)

#0141. Stem borer. Undetermined [T]. (mb)
#0140. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (mb)
#0139. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,L,P]. (mb)

___
mb - *C. marrubiastrum* (false motherwort)

Chamaecrista (Fabaceae)

#0142. Stem borer. Coleoptera: cf. Mordellidae [T,L]. (fs)

___
fs - *C. fasciculata* (partridge pea)

Chelone (Plantaginaceae)

#0143. Stem borer. Diptera: Agromyzidae: *Phytomyza* sp. (2 spp.?) [T,L,P,A]. (gl)
#0144. Stem borer. Lepidoptera: Tortricidae: Cochylini: cf. *Cochylichroa viscana* [T,L,P,A]. (gl)

___
gl - *C. glabra* (turtlehead)

Chenopodium (Chenopodiaceae)

#0145. Stem borer. Coleoptera: Curculionoidea: cf. Curculionidae: *Cosmobaris* sp. [T,L,A]. (sp)
#0146. Stem miner. Lepidoptera: cf. Gracillariidae: *Marmara* sp. [T]. (sp)

___
sp - undetermined *C.* sp. (lamb's-quarters)

Cichorium (Asteraceae)

#0147. Stem miner. Lepidoptera: cf. Gracillariidae: *Marmara* sp. [T]. (in)

___
in - *C. intybus* (chicory)

Cicuta (Apiaceae)

#0148. Petiole miner. Diptera: Agromyzidae: cf. *Ophiomyia* sp. [T,L,P,A]. (bf)

___
bf - *C. bulbifera* (bulblet-bearing water hemlock)

Circaea (Onagraceae)

#0149. Stem borer. Lepidoptera: Momphidae: *Mompha luciferella* [T,L,P,A]. (lu)
#0784. Local feeder in stem. Undetermined (cecidomyiid?) [T]. (lu)

___
lu - *C. lutetiana* (enchanter's nightshade)

Cirsium (Asteraceae)

#0151. Stem borer. Coleoptera: Mordellidae [T,L,P,A]. (ve)
#0152. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P,A]. (nv)
#0155. Stem borer. Lepidoptera: Noctuidae: *Papaipema arctivorens* [T,L,P,A]. (nv)
#0156. Stem borer. Pterophoridae: cf. *Platyptilia carduidactylus* [T,P,A]. (nv)
#0157. Borer in petioles of rosette leaves. Diptera [T]. (nv)
#0154. Petiole miner. Lepidoptera: Gracillariidae: cf. *Marmara* sp. [T,L]. (nv)
#0153. Midrib miner. Lepidoptera: Gelechiidae: *Scrobipalpa acuminatella* [T,P,A]. (ar, nv)
#0150. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Resseliella* [T,L]. (ve)
#0743. Local feeder in stem. Diptera: Tephritidae: *Urophora cardui* [T,L]. (ar)

___
ar - *C. arvense* (Canada thistle)
nv - undetermined native *C.* sp.
ve - *C. vulgare* (bull thistle)

Claytonia (Portulacaceae)

#0715. Stem/petiole borer. Diptera: cf. Anthomyiidae: *Pegomya flavifrons* [T,L]. (vi)

___
vi - *C. virginica* (Virginia spring beauty)

Clematis (Ranunculaceae)

#0159. Stem borer. Diptera: Agromyzidae: cf. *Phytomyza* sp. [T,L,P,A]. (vi)
#0162. Stem miner. Lepidoptera: Gracillariidae: cf. *Marmara* sp. [T,L]. (vi)
#0158. Local feeder in stem. Diptera: Agromyzidae: cf. *Phytomyza* sp. [T,L,P,A]. (vi)
#0161. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L,P,A]. (vi)
#0160. Local feeder in stem. Lepidoptera/Coleoptera [T,L]. (vi)
#0783. Local feeder in stem. Undetermined [T]. (vi)

___
vi - *C. virginiana* (virgin's bower)

Conyza (Asteraceae)

#0168. Stem borer. Coleoptera: Erotylidae: cf. *Acropteroxys gracilis* [T,L]. (ca)
#0167. Stem borer. Coleoptera: Mordellidae [T,L]. (ca)
#0166. Stem borer. Diptera: Agromyzidae [T,P]. (ca)
#0164. Stem miner. Diptera: Agromyzidae [T,P]. (ca)
#0165. Local feeder in petiole. Diptera: Cecidomyiidae: *Asteromyia modesta* [T,P,A]. (ca)
#0691. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Neolasioptera erigerontis* [T,L]. (ca)

___
ca - *C. canadensis* (horseweed)

Coreopsis (Asteraceae)

#0170. Stem borer. Coleoptera: Mordellidae [T,L,A]. (pm)
#0169. Local feeder in stem. Diptera: Cecidomyiidae [T,L]. (pm)
#0171. Local feeder in shoot apex. Diptera: Cecidomyiidae: *Contarinia* sp. [T,L]. (pm)

___
pm - *C. palmata* (coreopsis)

Cornus (Cornaceae)

#0172. Shoot and twig borer. Coleoptera: Cerambycidae [T,L]. (aa)
#0797. Midrib miner. Lepidoptera: Heliozelidae: *Antispila cornifoliella* [T,L]. (ru)

#0175. Local feeder in leaf midrib. Diptera: Cecidomyiidae: *Craneiobia tuba* [T]. (sp)
#0173. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera cornicola* [T,L]. (rc)
#0174. Local feeder in lateral shoot. Diptera: Cecidomyiidae [T,L]. (se)

___
aa - *C. alternifolia* (pagoda dogwood)
ru - *C. rugosa* (round-leaved dogwood)
rc - *C. racemosa* (gray dogwood)
se - *C. sericea* (red-osier dogwood)
sp - undetermined *C.* sp., either *C. amomum* (silky dogwood) or *C. racemosa* (gray dogwood)

Corylus (Betulaceae)

#0775. Stem miner. Lepidoptera: cf. Gracillariidae: *Marmara* sp. [T]. (sp)

___
sp - undetermined *C.* sp. (hazelnut)

Cryptotaenia (Apiaceae)

#0181. Stem borer. Coleoptera/Lepidoptera [T]. (ca)
#0179. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P,A]. (ca)
#0182. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (ca)
#0176. Borer in midrib and stem. Coleoptera: cf. Curculionidae: *Listronotus* sp. [T,L]. (ca)
#0177. Borer in stem (and midrib?). Coleoptera: cf. Brentidae: Apioninae [T,L,P,A]. (ca)
#0801. Internal feeder in stem. Diptera: Ceratopogonidae: Forcipomyiinae: *Forcipomyia* [T,L,P,A]. (ca)
#0180. Stem dweller. cf. Diptera: Cecidomyiidae [T,L]. (ca)

___
ca - *C. canadensis* (honewort)

Cucurbita (Cucurbitaceae)

#0751. Stem borer. Lepidoptera: Sesiidae: *Eichlinia cucurbitae* [T,L]. (pe)

___
pe - *C. pepo* (summer squash)

Cuscuta (Convolvulaceae)

#0185. Local feeder in stem. Coleoptera: Curculionidae: cf. *Smicronyx sculpticollis* [T]. (sp)

___
sp - undetermined *C.* sp. (dodder)

Dactylis (Poaceae)

#0782. Stem borer. Undetermined [T]. (gl)
#0758. Local feeder in stem. Hymenoptera: cf. Eurytomidae: *Tetramesa* [T,L]. (gl)
#0781. Local feeder in stem. Diptera: Cecidomyiidae [T,L]. (gl)

___
gl - *D. glomerata* (orchard grass)

Dalea (Fabaceae)

#0187. Stem borer. Lepidoptera [T,L]. (vi)
#0186. Borer in receptacle of seedhead. Undetermined [T]. (pu)

___
pu - *D. purpurea* (purple prairie clover)
vi - *D. villosa* (silky prairie clover)

Daucus (Apiaceae)

#0191. Stem borer. Coleoptera: Curculionidae: cf. *Listronotus* sp. [T,L,A]. (ca)
#0188. Stem borer. Coleoptera: cf. Mordellidae [T,L]. (ca)
#0190. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P]. (ca)
#0189. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (ca)

___
ca - *D. carota* (Queen Anne's lace, wild carrot)

Desmodium (Fabaceae)

#0193, 0195, 0196. Stem borer. Coleoptera: Mordellidae [T,L,A]. (il, s1, s2)
#0192, 0194. Stem borer. Diptera: Agromyzidae: cf. *Melanagromyza* sp. [T,L,P,A]. (il, s1)
#0197. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera desmodii* [T]. (s2)

___
il - *D. illinoense* (Illinois tick-trefoil)
s1 - undetermined prairie *D.* sp. (tick-trefoil)
s2 - undetermined woodland *D.* sp. (tick-trefoil)

Dichanthelium (Poaceae)

#0198. Stem borer. Undetermined (Lepidoptera?) [T]. (sp)

___
sp - undetermined woodland *D.* sp. (panic grass)

Diervilla (Caprifoliaceae)

#0199. Midrib and leaf miner. Diptera: Agromyzidae: *Phytomyza tarnwoodensis* [T,P]. (lo)
#0200. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Neolasioptera caulicola* [T,L]. (lo)

___
lo - *D. lonicera* (diervilla)

Dioscorea (Dioscoreaceae)

#0201. Local feeder in petiole. Diptera: Cecidomyiidae [T,L]. (vi)

___
vi - *D. villosa* (wild yam)

Dodecatheon (Primulaceae)

#0202. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (sp)

___
sp - undetermined *D.* sp. (shooting star)

Echinacea (Asteraceae)

#0204. Stem borer. Coleoptera: Mordellidae [T,L,A]. (sp)
#0203. Stem borer. Diptera: Agromyzidae [T,P]. (sp)

___
sp - undetermined *E.* sp. (purple coneflower)

Echinocystis (Cucurbitaceae)

#0205. Stem borer. Lepidoptera: cf. Sesiidae: *Eichlinia cucurbitae* [T,L]. (lo)

___
lo - *E. lobata* (wild cucumber)

Elymus (Poaceae)

#0209. Shoot borer. Coleoptera/Lepidoptera [T]. (sp)
#0207, 0211, 0635. Stem borer. Diptera: Dolichopodidae: *Thrypticus* sp. [T,L,P,A]. (re, sp, vi)
#0206, 0210. Local feeder in stem. Diptera: Cecidomyiidae: *Hybolasioptera elymi* [T,L]. (sp?, vi)
#0208. Local feeder in stem. Hymenoptera: Eurytomidae: *Tetramesa* sp. [T,L,A]. (sp)
#0692. Stem feeder. Hymenoptera [T,L]. (ca)

___
ca - *E. canadensis* (Canada wild rye)
re - *E. repens* (quackgrass)

sp - undetermined *E.* sp. (wild rye); tentative ID
vi - *E. virginicus* (Virginia wild rye)

Enemion (Ranunculaceae)

#0212. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (bi)

___
bi - *E. biternatum* (false rue anemone)

Equisetum (Equisetaceae)

#0213. Stem borer. Lepidoptera: cf. Noctuidae: *Papaipema* sp. [T,L]. (sp)

___
sp - undetermined *E.* sp. (horsetail)

Erechtites (Asteraceae)

#0759. Stem miner. Lepidoptera: Gracillariidae [T]. (sp)

___
sp - undetermined *E.* sp. (burnweed)

Erigeron (Asteraceae)

#0219. Stem borer. Coleoptera: Erotylidae: cf. *Acropteroxys gracilis* [T,L]. (an)
#0215. Stem borer. Diptera: Agromyzidae: *Melanagromyza virens* [T,L,P,A]. (an)
#0218, 0220. Shoot and stem borer(s). Coleoptera/Lepidoptera [T]. (an)
#0216. Stem miner. Diptera: Agromyzidae: cf. *Ophiomyia* [T,P]. (an)
#0214. Borer in petiole of rosette leaf. Coleoptera: cf. Mordellidae [T,L]. (an)
#0744. Miner in petiole and leaf blade. Diptera: Agromyzidae [T,L]. (an)
#0217. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L,P,A]. (an)

___
an - *E. annuus* (daisy fleabane)
sp - undetermined *E.* sp. (fleabane)

Eryngium (Apiaceae)

#0221. Stem borer. Diptera: Agromyzidae: cf. *Melanagromyza* sp. [T,P]. (yc)

___
yc - *E. yuccifolium* (rattlesnake master)

Euonymus (Celastraceae)

#0716. Stem borer. Lepidoptera: cf. Yponomeutidae: *Yponomeuta* sp. [T,L]. (at)

___
at - *E. atropurpureus* (eastern wahoo)

Eupatorium (Asteraceae)

#0673. Stem borer. Coleoptera/Lepidoptera (Sesiidae: *Carmenta pyralidiformis*?) [T]. (pm)
#0223. Stem borer. Coleoptera: Erotylidae: *Acropteroxys gracilis* [T,L,A]. (pm)
#0224. Stem borer. Coleoptera: Mordellidae [T,L,P,A]. (pm)
#0225. Stem borer. Diptera: cf. Agromyzidae [T]. (pm)
#0672. Local feeder in stem. Undetermined [T]. (pm)
#0222, 0671. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera perfoliata* [T,L]. (am, pm)

___
am - *E. altissimum* (tall thoroughwort)
pm - *E. perfoliatum* (boneset)

Euphorbia (Euphorbiaceae)

#0226. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Neolasioptera* sp. [T,L]. (co)

#0227. Local feeder in shoot apex. Diptera: Cecidomyiidae: *Dasineura* sp. [T,L]. (co)

___
co - *E. corollata* (flowering spurge)

Eutrochium (Asteraceae)

#0228. Stem borer. Coleoptera: Erotylidae: cf. *Acropteroxys gracilis* [T,L,P,A]. (mc)
#0233, 0630. Stem borer. Coleoptera: Mordellidae [T,L,P,A]. (pr, mc)
#0229. Stem borer. Diptera: Agromyzidae: *Melanagromyza vanderlindeni* [T,P,A]. (mc)
#0232. Stem borer. Lepidoptera [T,L]. (mc)
#0737. Stem borer. Lepidoptera: Noctuidae: *Papaipema* [T,L]. (mc)
#0693. Stem borer. Lepidoptera: Tortricidae: Cochylini [L,A]. (mc)
#0230, 0234. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. (2 spp.?) [T,P,A]. (pr, mc)
#0235. Local feeder in petiole. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L]. (pr)
#0231. Local feeder in stem. Diptera: Tephritidae: *Eutreta* sp. [T,L,P,A]. (mc)

___
pr - *E. purpureum* (sweet scented joe pye weed)
mc - *E. maculatum* (spotted joe pye weed)

Fallopia (Polygonaceae)

#0237. Stem borer. Lepidoptera: Gelechiidae [T,L,P]. (sc)
#0236. Stem miner. Undetermined (Lepidoptera?) [T]. (jp)

___
jp - *F. japonica* (Japanese knotweed)
sc - *F. scandens* (climbing false buckwheat)

Festuca (Poaceae)

#0390. Local feeder in stem. Hymenoptera: Eurytomidae: *Tetramesa* sp. [T,L,A]. (sb)

___
sb - *F. subverticillata* (nodding fescue) (tentative ID)

Fraxinus (Oleaceae)

#0238. Stem miner. Lepidoptera: Gracillariidae: *Marmara* sp. [T]. (pa, sp)
#0239. Local feeder in midrib. Diptera: Cecidomyiidae: *Dasineura* or possibly *Contarinia* sp. [T,L]. (sp)

___
pa - *F. pennsylvanica* (green ash)
sp - undetermined *F.* sp. (ash)

Galeopsis (Lamiaceae)

#0240. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (tt)

___
tt - *G. tetrahit* (brittlestem hedge-nettle)

Galinsoga (Asteraceae)

#0241. Local feeder in stem. Diptera: Tephritidae: *Eutreta* sp. [T,L,P,A]. (sp)

___
sp - undetermined *G.* sp. (galinsoga)

Galium (Rubiaceae)

#0244. Stem borer. Diptera: Agromyzidae: cf. *Ophiomyia* sp. [T,L,P,A]. (s2)
#0246, 0655. Stem borer. Diptera: Agromyzidae: cf. *Liriomyza* sp. (+1 spp.?) [T,L,P]. (ap, br)
#0656. Stem borer. Lepidoptera: Momphidae: *Mompha* sp. [T,L,P,A]. (br)
#0242, 0245. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P,A]. (br, s2)
#0247. Local feeder in stem. Diptera: Cecidomyiidae [T,P,A]. (ap)
#0243. Stem feeder. Diptera: cf. Chloropidae [P]. (s1)

___
ap - *G. aparine* (bedstraw)
br - *G. boreale* (northern bedstraw)
s1 - undetermined *G.* sp. 1
s2 - undetermined *G.* sp. 2

Gaura (Onagraceae)

#0248. Local feeder in stem. Lepidoptera: Momphidae: *Mompha rufocristatella* [T,P,A]. (bi)

___
bi - *G. biennis* (biennial gaura)

Gentiana (Gentianaceae)

#0249. Stem borer. Coleoptera: cf. Mordellidae [T,L]. (aw)
#0250. Stem borer. Diptera: Agromyzidae: *Melanagromyza gentianivora* [T,P,A]. (aw)
#0251. Stem borer. Lepidoptera: Tortricidae: cf. *Endothenia hebesana* [T,L,P,A]. (fl)

___
aw - *G. andrewsii* (bottle gentian)
fl - *G. flavida* (cream gentian)

Geranium (Geraniaceae)

#0252. Borer in petiole and stem. Diptera: Agromyzidae: cf. *Melanagromyza* sp. [T,P,A]. (mc)
#0253. Stem borer. Coleoptera/Lepidoptera (Noctuidae: *Papaipema* sp.?) [T]. (mc)

___
mc - *G. maculatum* (wild geranium)

Geum (Rosaceae)

#0255. Stem borer. Diptera: Anthomyiidae: *Pegomya* cf. *rubivora* [T,L,P,A]. (ca)
#0257. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (ca)
#0254. Miner in petiole of basal leaf. Diptera: Agromyzidae: cf. *Ophiomyia* sp. [T,P]. (ca)
#0256. Local feeder in petiole and stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L]. (ca)

___
ca - *G. ?canadense* (white avens; genus ID certain, species ID tentative)

Glechoma (Lamiaceae)

#0259. Stem borer. Undetermined [T]. (hd)
#0258. Local feeder in stem, midrib, and petiole. Hymenoptera: Cynipidae: *Liposthenes glechomae* [T,L]. (hd)

___
hd - *G. hederacea* (ground ivy)

Hackelia (Boraginaceae)

#0260. Stem borer. Coleoptera: Erotylidae: Languriini [T,L]. (vi)

___
vi - *H. virginiana* (stickseed)

Helenium (Asteraceae)

#0262. Stem borer. Coleoptera: Mordellidae [T,L,A]. (au)
#0261. Stem borer. Diptera: Agromyzidae [T,P]. (au)

___
au - *H. autumnale* (sneezeweed)

Helianthus (Asteraceae)

#0264. Stem borer. Coleoptera: Curculionidae: *Lixus macer* [T,A]. (gr)

#0270. Stem borer. Coleoptera: Mordellidae [T,L,P,A]. (s1)
#0263, 0265. Stem borer. Diptera: Agromyzidae (2+ spp.?) [T,P,A]. (oc, s2)
#0659. Stem borer. Diptera: cf. Tephritidae: *Strauzia* sp. [T]. (s1)
#0657. Stem borer. Lepidoptera: Tortricidae [T,L,P,A]. (s1)
#0266. Local feeder. Diptera [T,L]. (s1)
#0267. Local feeder in stem. Diptera: Cecidomyiidae [T,P,A]. (s1)
#0268. Local feeder in stem. Diptera: Cecidomyiidae: *Asphondylia helianthiglobulus* [T]. (s1)
#0269. Local feeder in stem. Lepidoptera: Bucculatricidae: cf. *Bucculatrix simulans* [T,L]. (s1)

___
gr - *H.* cf. *grosseserratus* (sawtooth sunflower)
oc - *H. occidentalis* (western sunflower)
s1 - undetermined wild *H.* spp. (sunflowers)
s2 - undetermined cultivated *H.* sp. (sunflower)

Heliopsis (Asteraceae)

#0271. Stem borer. cf. Lepidoptera: Noctuidae: *Papaipema* sp. [T]. (he)
#0694. Stem miner. cf. Diptera: Agromyzidae [T]. (he)

___
he - *H. helianthoides* (smooth oxeye)

Heracleum (Apiaceae)

#0273. Stem borer. Coleoptera: Mordellidae [T,L]. (mx)
#0275. Stem borer. Lepidoptera: Depressariidae: cf. *Depressaria radiella* [T,L,P,A]. (mx)
#0274. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (mx)
#0272. Stem and petiole borer. Coleoptera: Curculionoidea: cf. Brentidae: Apioninae [T,L,P,A]. (mx)
#0695. Miner/borer in stem and in petiole of basal leaf. Diptera: Agromyzidae: *Phytomyza* sp. [T,L,P,A]. (mx)

___
mx - *H. maximum* (cow parsnip)

Hesperis (Brassicaceae)

#0276. Miner in midrib. Diptera: Drosophilidae [T,L,P,A]. (ma)

___
ma - *H. matronalis* (dame's rocket)

Hieracium (Asteraceae)

#0277. Stem borer. Diptera: Agromyzidae: *Melanagromyza hieracii* [T,P,A]. (sc)
#0278. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (sc)

___
sc - *H. scabrum* (hawkweed)

Humulus (Cannabaceae)

#0279. Stem borer. Lepidoptera: Tortricidae: cf. *Grapholita* sp. [T,P,A]. (sp)

___
sp - undetermined *Humulus* sp. (hops)

Hydrophyllum (Boraginaceae)

#0281. Borer in stem and petiole. Lepidoptera: Tortricidae: Cochylini [T,L,P,A]. (ap)
#0280, 0282. Local feeder in petiole of basal leaf. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L]. (ap, vi)
#0283. Miner/borer in petiole of basal leaf (also in stem?). Diptera: Sciaridae [T,L,P,A]. (vi)

___
ap - *H. appendiculatum* (appendaged waterleaf)
vi - *H. virginiana* (Virginia waterleaf)

Hypericum (Hypericaceae)

#0284. Stem borer. Undetermined (large larva, est. length >10mm) [T]. (s1)
#0285. Local feeder in stem. Undetermined [T]. (s2)

___
s1 - undetermined *H.* sp., large fruits, inhabitant of old fields
s2 - undetermined woodland *H.* sp.

Impatiens (Balsaminaceae)

#0287. Petiole and stem borer. Lepidoptera: Tortricidae: *Pristerognatha agilana* [T,L]. (sp)
#0289. Internal feeder in petiole. Undetermined [T]. (sp)
#0288. Local feeder(s) in stem and petiole. Diptera: Cecidomyiidae: *Neolasioptera impatientifolia* (+ *Lasioptera centerensis*?) [T,L,P]. (sp)

___
sp - undetermined *I.* sp(p)., *I. capensis* or *I. pallida* or both (jewelweeds)

Juglans (Juglandaceae)

#0290. Borer in shoot and petiole. Undetermined [T,L]. (na)

___
na - *J. nigra* (black walnut)

Juniperus (Cupressaceae)

#0291. Stem miner. Lepidoptera: cf. Gracillariidae: *Marmara* sp. [T,L]. (vi)

___
vi - *J. virginiana* (eastern red cedar)

Lactuca (Asteraceae)

#0677. Stem borer. Undetermined [T]. (ca)
#0295. Stem borer. Diptera: Agromyzidae [T,P,A]. (ca)
#0297. Stem borer. Lepidoptera: Tortricidae: Cochylini [T,P,A]. (ca)
#0296, 0301. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. (2 spp.?) [T,L,P,A]. (bi, ca)
#0293. Stem and petiole miner. Lepidoptera: cf. Gracillariidae: *Marmara* sp. [T]. (bi, sp)
#0294, 0300. Miners in midrib and petiole. Diptera: Agromyzidae: *Ophiomyia* spp. (~2 spp.) [T,P,A]. (ca, sp)
#0299. Petiole miner/borer. Diptera: Agromyzidae [T,P]. (sp)
#0302. Local feeder in petiole. Diptera: Cecidomyiidae [T,P,A]. (sp)
#0292. Local feeder in stem. Hymenoptera: Cynipidae [T,L,A]. (bi)

___
bi - *L.* cf. *biennis*
ca - *L. canadensis*
sp - undetermined *L.* sp., hairy basal leaves, in woods

Laportea (Urticaceae)

#0303. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P,A]. (ca)
#0733. Stem miner. Lepidoptera: cf. Gracillariidae: *Marmara* sp. [T]. (ca)
#0304. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L,P,A]. (ca)
#0776. Local feeder in stem or petiole. Lepidoptera [T,L]. (ca)
#0305. Local feeder in petiole. Diptera: Cecidomyiidae: *Dasineura* sp. [T,L]. (ca)

___
ca - *L. canadensis* (wood nettle)

Lapsana (Asteraceae)

#0306. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P]. (co)

___
co - *L. communis* (nipplewort)

Leersia (Poaceae)

#0307. Shoot borer. Diptera: cf. Tephritoidea: Ulidiidae [T,L]. (vi)

___
vi - *L. virginica* (white grass)

Leonurus (Lamiaceae)

#0309. Stem borer. Coleoptera/Lepidoptera (Noctuidae: *Papaipema* sp.?) [T]. (cr)
#0308. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (cr)

___
cr - *L. cardiaca* (motherwort)

Lepidium (Brassicaceae)

#0311. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,L,P,A]. (vi)
#0310. Midrib and leaf blade miner. Diptera: Agromyzidae [T]. (vi)

___
vi - *L. virginicum* (peppergrass)

Leucanthemum (Asteraceae)

#0697. Stem borer. Coleoptera: Mordellidae [T,L]. (vu)
#0745. Local feeder in stem. Diptera: Cecidomyiidae [A]. (vu)

___
vu - *L. vulgare* (ox-eye daisy)

Lespedeza (Fabaceae)

#0312. Stem borer. Coleoptera/Lepidoptera [T]. (ca)

___
ca - *L. capitata* (round-headed bush clover)

Liatris (Asteraceae)

#0668. Stem borer. Coleoptera/Lepidoptera [T]. (sp)

___
sp - undetermined *L.* sp. (blazing star)

Lithospermum (Boraginaceae)

#0313. Local feeder in stem. Diptera: Cecidomyiidae [T]. (sp)

___
sp - undetermined *L.* sp. (puccoon)

Lobelia (Lobeliaceae)

#0315. Stem borer. Coleoptera: Erotylidae: *Languria angustana* [T,L,P,A]. (si)
#0314. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P,A]. (in)
#0317. Stem miner. Lepidoptera: Gracillariidae: cf. *Marmara* sp. [T,L]. (si)
#0316. Local feeder in stem, petiole, and midrib. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L,P,A]. (si)

___
in - *L. inflata* (Indian tobacco)
si - *L. siphilitica* (great blue lobelia)

Lonicera (Caprifoliaceae)

#0318. Local feeder in stem. Diptera: Cecidomyiidae [T,L]. (sp)

___
sp - undetermined *L.* sp., native woody vine

Lupinus (Fabaceae)

#0678. Stem borer. Coleoptera: Mordellidae [T,L,A]. (sp)
#0680. Local feeder in petiole. Undetermined (cf. Cecidomyiidae) [T]. (sp)

___
sp - undetermined *L.* sp., cultivar in residential garden

Lycopodium (Lycopodiaceae)

#0319. Borer in shoot tips. Undetermined (Lepidoptera?) [T]. (sp)

___
sp - undetermined *L.* sp. (clubmoss)

Lycopus (Lamiaceae)

#0323. Internal feeder in stem. Coleoptera: cf. Curculionidae [T,L]. (am)
#0320. Stem borer. Coleoptera: Mordellidae [T,L]. (am)
#0322, 0637. Stem miner/borer; petiole and leaf blade miner. Lepidoptera: Opostegidae: *Pseudopostega* sp. [T,L]. (am, un)
#0638. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Neolasioptera lycopi* [T,L]. (un)

___
am - *L. americanus* (American water horehound)
un - *L. uniflorus* (northern bugleweed)

Maianthemum (Ruscaceae)

#0324. Stem borer. Diptera: Scathophagidae: *Plethochaeta varicolor* [T,L,P,A]. (sp)
#0325. Local feeder in stem. Diptera: Cecidomyiidae [T]. (sp)

___
sp - undetermined *M.* sp. (Solomon's plume)

Melilotus (Fabaceae)

#0753. Stem borer. Coleoptera: Erotylidae [T,P,A]. (al)

___
al - *M. albus* (white sweet clover)

Menispermum (Menispermaceae)

#0327. Stem borer. Coleoptera: cf. Mordellidae [T,L]. (ca)
#0328. Stem miner. Lepidoptera: Gracillariidae: cf. *Marmara* sp. [T,L]. (ca)

___
ca - *M. canadense* (moonseed)

Mentha (Lamiaceae)

#0329. Stem borer. Coleoptera: Mordellidae: cf. *Mordellina pustulata* [T,L,A]. (ar)
#0719. Stem borer. Coleoptera/Lepidoptera: cf. Lepidoptera: Noctuidae: *Papaipema* [T]. (su)
#0639. Stem miner/borer. Lepidoptera: Opostegidae: *Pseudopostega* sp. [T,L,P]. (ar)
#0746. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,L]. (ar)
#0647. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Neolasioptera* sp. [T]. (ar)
#0646. Internal feeder in stem. Coleoptera/Lepidoptera [T]. (ar)

___
ar - *M.* cf. *arvensis* (wild mint)
su - M. suaveolens (apple mint)

Mimulus (Phrymaceae)

#0645. Stem borer. Coleoptera/Lepidoptera (Curculionidae?) [T]. (rg)
#0330. Stem miner. Diptera: Agromyzidae: *Ophiomyia mimuli* [T,L,P]. (rg)

___

rg - *M. ringens* (monkeyflower)

Mirabilis (Nyctaginaceae)

#0331. Stem borer. Lepidoptera: Heliodinidae [T,P,A]. (sp)

___
sp - undetermined *M.* sp. (four o'clock)

Mitella (Saxifragaceae)

#0332. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P,A]. (di)
#0333. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L,P,A]. (di)

___
di - *M. diphylla* (miterwort)

Monarda (Lamiaceae)

#0334. Stem borer. Coleoptera: Cerambycidae: cf. *Oberea perspicillata* [T,L,A]. (fi)
#0337. Stem borer. Coleoptera: Curculionidae: cf. Baridinae [T,A]. (fi)
#0338. Stem borer. Coleoptera: Erotylidae: *Languria* cf. *trifasciata* [T,L,P,A]. (fi)
#0652. Stem borer. Coleoptera: Mordellidae [T,L]. (fi)
#0335. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,L,P,A]. (fi)
#0720. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (fi)
#0687. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (fi)
#0339. Stem miner/borer; petiole and leaf blade miner. Lepidoptera: Opostegidae: *Pseudopostega* [T,L,P]. (fi)
#0336. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera monardae* [T,L]. (fi)

___
fi - *M. fistulosa* (bee balm, wild bergamot)

Muhlenbergia (Poaceae)

#0341. Stem borer. Diptera: Dolichopodidae: *Thrypticus* cf. *muhlenbergiae* [T,L]. (sp)
#0340. Local feeder in stem. Diptera: Cecidomyiidae: *Astictoneura muhlenbergiae* [T,L,P,A]. (sp)

___
sp - undetermined *M.* sp. (muhly grass)

Myosoton (Caryophyllaceae)

#0342. Stem borer. Lepidoptera: cf. Noctuidae: *Papaipema* sp. [T,L]. (aq)
#0747. Local feeder in stem. Diptera: Cecidomyiidae [T,L]. (aq)

___
aq - *M. aquaticum* (chickweed); plant ID tentative

Nabalus (Asteraceae)

#0411. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P,A]. (al)
#0409. Stem and petiole miner. Diptera: Agromyzidae: *Ophiomyia nabali* (+1 sp.?) [T,L,P,A]. (al)
#0760. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Resseliella* sp. [T,L]. (al)

___
al - *N. albus* (white rattlesnake-root)

Napaea (Malvaceae)

#0343. Stem and petiole borer. Diptera: Agromyzidae: cf. *Melanagromyza* sp. [T,P,A]. (di)

___
di - *N. dioica* (glade mallow)

Nelumbo (Nelumbonaceae)

#0344. Stem borer. Lepidoptera: cf. Crambidae: *Ostrinia penitalis* [T,L]. (lu)

___
lu - *N. lutea* (American lotus)

Nepeta (Lamiaceae)

#0346. Stem borer. Coleoptera: Erotylidae: cf. *Acropteroxys gracilis* [T,L,A]. (ca)
#0345. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (ca)

___
ca - *N. cataria* (catnip)

Oenothera (Onagraceae)

#0347. Stem borer. Coleoptera: Curculionidae: *Tyloderma foveolatum* [T,A]. (sp)

___
sp - undetermined *O.* sp. (evening primrose)

Onosmodium (Boraginaceae)

#0755. Internal feeder in stem. Undetermined [T]. (be)

___
be - O. bejariense (false gromwell)

Osmorhiza (Apiaceae)

#0349. Internal feeder in stem and petiole. Coleoptera: Brentidae: Apioninae [T,L,P,A]. (sp)
#0350. Stem and petiole borer. Coleoptera: Curculionidae: *Listronotus oregonensis* [T,L,A]. (sp)
#0351. Stem borer. Coleoptera: Erotylidae: *Acropteroxys gracilis* [T,L,A]. (sp)
#0348. Stem borer. Coleoptera: Mordellidae [T,L,P,A]. (sp)
#0352. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P,A]. (sp)
#0353. Stem miner. Diptera: Agromyzidae: *Ophiomyia osmorhizae* [T,L,P,A]. (sp)

___
sp - undetermined *O.* sp., *O. claytonii* or *O. longistylis* (sweet cicely, aniseroot)

Oxalis (Oxalidaceae)

#0354. Local feeder in stem. Diptera: Cecidomyiidae [T,L]. (st)

___
st - *O. stricta* (yellow wood sorrel)

Packera (Asteraceae)

#0355. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [A]. (sp)

___
sp - undetermined *P.* sp. (ragwort, groundsel)

Panicum (Poaceae)

#0752. Local feeder in stem. Diptera: Cecidomyiidae [T,L]. (vi)

___
vi - *P. virgatum* (switchgrass)

Parietaria (Urticaceae)

#0356. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Neolasioptera* [T,L]. (pa)

___
pa - *P. pensylvanica* (Pennsylvania pellitory)

Parthenium (Asteraceae)

#0357. Stem borer. Diptera: Agromyzidae: cf. *Melanagromyza* sp. [T,P]. (in)

#0698. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (in)

___
in - *P. integrifolium* (wild quinine)

Parthenocissus (Vitaceae)

#0359. Stem borer. Diptera: Agromyzidae [T,L,P,A]. (sp)
#0729. Internal feeder in stem. Lepidoptera: Heliozelidae: cf. *Heliozela* sp. [T,L]. (sp)
#0361. Stem miner. Lepidoptera: Gracillariidae: cf. *Marmara* sp. [T,L]. (sp)
#0785. Local feeder in stem. Diptera: Cecidomyiidae [A]. (sp)
#0362. Local feeder in petiole. Diptera: Cecidomyiidae [T,P]. (sp)
#0364. Local feeder in midrib. Diptera: Cecidomyiidae: cf. *Dasineura parthenocissi* [T]. (sp)
#0363. Internal feeder in petiole. Lepidoptera: Heliozelidae: cf. *Heliozela* sp. near *aesella* [T,L]. (sp)

___
sp - undetermined *P.* sp. (woodbine / Virginia creeper)

Pastinaca (Apiaceae)

#0366. Stem borer. Diptera: Agromyzidae: cf. *Melanagromyza* sp. [T,P]. (sa)
#0622. Stem miner. Diptera: Agromyzidae: cf. *Ophiomyia* sp. [T,P]. (sa)
#0790. Petiole borer. Lepidoptera: Depressariidae: *Depressaria radiella* [T,L]. (sa)
#0365. Miner/borer in petiole (and stem?). Diptera: Agromyzidae: *Phytomyza* sp. [T,P,A]. (sa)

___
sa - *P. sativa* (wild parsnip)

Patis (Poaceae)

#0367. Stem borer. Coleoptera/Lepidoptera [T]. (ra)

___
ra - *P. racemosa* (black-fruited mountain rice grass)

Pedicularis (Orobanchaceae)

#0368. Stem borer. Diptera: Agromyzidae: *Phytomyza pedicularicaulis* [T,L]. (ca)

___
ca - *P. canadensis* (wood betony, lousewort)

Penstemon (Plantaginaceae)

#0369. Stem borer. Diptera: Agromyzidae: cf. *Melanagromyza* sp. [T,P]. (sp)
#0370. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,L,P,A]. (sp)

___
sp - undetermined *P.* sp. (beardtongue)

Penthorum (Penthoraceae)

#0371. Stem miner/borer. Coleoptera: Curculionidae [T,L,A]. (se)

___
se - *P. sedoides* (ditch stonecrop)

Persicaria (Polygonaceae)

#0374. Stem borer. Lepidoptera: Gelechiidae: cf. *Monochroa* sp. [T,L,A]. (vi)
#0756. Local feeder in stem. Diptera: Cecidomyiidae [T,L]. (vi)

___
vi - *P. virginiana* (jumpseed)

Phalaris (Poaceae)

#0375. Local feeder in stem. Diptera: Cecidomyiidae: *Mayetiola* cf. *phalaris* [T,L,P,A]. (ar)

#0699. Local feeder in stem. Hymenoptera: cf. Eurytomidae: *Tetramesa* sp. [T,L]. (ar)

___
ar - *P. arudinacea* (reed canary grass)

Phleum (Poaceae)

#0750. Local feeder in stem. Hymenoptera: Eurytomidae [T,L]. (pr)

___
pr - *P. pratense* (timothy grass)

Phlox (Polemoniaceae)

#0378. Stem borer. Coleoptera: cf. Curculionidae [T,L]. (di)
#0376. Stem borer. Diptera: Agromyzidae: Phytomyzinae [T,L,P]. (di)
#0379. Stem borer. Diptera: Agromyzidae: *Melanagromyza phloxicaulis* [T,P,A]. (pi)
#0377. Stem miner. Diptera: Agromyzidae: cf. *Ophiomyia* sp. [T,P]. (di)
#0380. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L]. (pi)

___
di - *P. divaricata* (wild blue phlox)
pi - *P. pilosa* (prairie phlox)

Phryma (Phrymaceae)

#0381. Stem borer. Coleoptera: cf. Scolytidae [T,A]. (le)
#0382. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L]. (le)

___
le - *P. leptostachya* (American lopseed)

Physalis (Solanaceae)

#0383. Stem borer. Coleoptera: Curculionidae: cf. *Trichobaris* sp. [T,A]. (sp)

___
sp - undetermined *P.* sp. (ground cherry)

Physocarpus (Rosaceae)

#0384. Local feeder in pedicel. Diptera: Cecidomyiidae [T,L]. (op)
#0385. Local feeder in midrib. Diptera: Cecidomyiidae: *Contarinia* sp. [T]. (op)

___
op - *P. opulifolius* (ninebark)

Physostegia (Lamiaceae)

#0628. Borer in stem and rhizome. Coleoptera: Curculionidae [T,L,A]. (vi)
#0627. Stem borer. Lepidoptera: Tortricidae: cf. *Endothenia hebesana* [T,L]. (vi)
#0626. Stem miner. Diptera: Agromyzidae: cf. *Ophiomyia* sp. [T]. (vi)

___
vi - *P. virginiana* (obedient plant)

Pilea (Urticaceae)

#0713. Stem miner/borer. Coleoptera: cf. Curculionoidea [T,L]. (sp)
#0386. Stem borer. Diptera: Agromyzidae: cf. *Melanagromyza* sp. [T,L,P]. (fo)

___
fo - *P. fontana* (clearweed)
sp - undetermined *P.* sp. (clearweed)

Plantago (Plantaginaceae)

#0664. Stem borer. Coleoptera/Lepidoptera [T]. (sp)
#0791. Petiole miner. Coleoptera: Chrysomelidae: *Dibolia borealis* [T,L]. (sp)

#0794. Petiole and leaf blade miner. Diptera: Agromyzidae [T,P]. (sp)
#0387. Local feeder in stem. Diptera: Cecidomyiidae [T,L]. (ru)

___
ru - *P. rugelii* (Rugel's plantain)
sp - undetermined *P.* sp. (plantain)

Poa (Poaceae)

#0689. Stem borer. Diptera: Dolichopodidae: *Thrypticus* sp. [T,L]. (sp)

___
sp - undetermined *P.* sp. (bluegrass)

Polemonium (Polemoniaceae)

#0391. Petiole borer. Diptera [T]. (rp)

___
rp - *P. reptans* (Jacob's ladder)

Polymnia (Asteraceae)

#0400. Stem borer. Coleoptera: Curculionidae (*Rhodobaenus* sp.?) [T,P]. (ca)
#0401. Stem borer. Coleoptera: Curculionidae [T,L,P,A]. (ca)
#0676. Stem borer. Coleoptera: Erotylidae: cf. *Acropteroxys gracilis* [T,L]. (ca)
#0393. Stem borer. Coleoptera: Mordellidae [T,L]. (ca)
#0394. Stem borer. Diptera (Tephritidae?) [T,L]. (ca)
#0396. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P,A]. (ca)
#0403. Stem borer. Lepidoptera: cf. Tortricidae [T,L]. (ca)
#0402. Stem borer. Lepidoptera [T,L]. (ca)
#0404. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (ca)
#0399. Stem miner. Lepidoptera: Gracillariidae: cf. *Marmara* sp. [T,L]. (ca)
#0395. Midrib and petiole miner. Diptera: Agromyzidae: cf. *Liriomyza hypopolymnia* [T]. (ca)
#0397. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L,P,A]. (ca)
#0398. Local feeder in stem. Diptera: Tephritidae: *Eutreta* sp. [T,L,P,A]. (ca)

___
ca - *P. canadensis* (leaf-cup)

Populus (Salicaceae)

#0406. Internal feeder in stem. cf. Coleoptera: Curculionidae: *Cryptorhynchus lapathi* [T]. (sp)
#0408. Petiole miner. Lepidoptera: Nepticulidae: *Ectoedemia* cf. *argyropeza* [T,L]. (tr)
#0405. Internal feeder in stem. Undetermined [T]. (sp)
#0631. Local feeder in petiole. Hemiptera: Aphididae: *Pemphigus populitransversus* [T]. (de)
#0407. Local feeder in petiole. Lepidoptera: Nepiculidae: *Ectoedemia populella* [T,L]. (tr)

___
de - *P. deltoides* (cottonwood)
sp - undetermined *P.* sp. (poplar/aspen)
tr - *P. tremuloides* (quaking aspen)

Potentilla (Rosaceae)

#0410. Stem borer. cf. Lepidoptera: Noctuidae: *Papaipema* sp. [T]. (no)

___
no - *P. norvegica* (rough cinquefoil)

Prunella (Lamiaceae)

#0412. Stem borer. Coleoptera: Mordellidae [T,L]. (vu)
#0413. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Neolasioptera* sp. [T,P]. (vu)
#0773. Local feeder in shoot and petiole. Diptera: Cecidomyiidae [T,L]. (vu)

___
vu - *P. vulgaris* (self-heal)

Prunus (Rosaceae)

#0418. Stem borer. Lepidoptera: cf. Tortricidae: *Grapholita prunivora* [T,L,P,A]. (sp)
#0416. Borer in shoot and rachis. Lepidoptera: Argyresthiidae: *Argyresthia* sp. [T,L,A]. (vi)
#0417. Stem borer. Lepidoptera: Sesiidae: *Synanthedon pictipes* [T,P,A]. (vi)
#0414. Stem miner. Lepidoptera: Gracillariidae: *Marmara* sp. [T]. (se)
#0780. Midrib miner. Lepidoptera: Heliozelidae [T,L]. (se)
#0415. Local feeder in shoot. Diptera: Cecidomyiidae: *Contarinia cerasiserotinae* [T,L]. (vi)
#0721. Local feeder in midrib. cf. Diptera: Cecidomyiidae [T]. (na)

___
na - *P. nigra* (Canada plum)
se - *P. serotina* (black cherry)
sp - undetermined *P.* sp. (cherry)
vi - *P. virginiana* (chokecherry)

Pseudognaphalium (Asteraceae)

#0419. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P,A]. (ob)

___
ob - *P. obtusifolium* (sweet everlasting)

Pycnanthemum (Lamiaceae)

#0422. Local feeder in stem. Diptera: Cecidomyiidae [T,L]. (sp)
#0730. Stem borer. Coleoptera/Lepidoptera [T]. (sp)

___
sp - undetermined *P.* sp. (mountain mint)

Quercus (Fagaceae)

#0774. Stem borer. Lepidoptera [T,L]. (ru)
#0735, 0736. Stem borer, midrib borer. Lepidoptera: Gracillariidae: cf. *Neurobathra strigifinitella* [T]. (bi, ru)
#0726. Stem miner. Lepidoptera [T]. (al)
#0731. Local feeder in stem. cf. Hymenoptera: Cynipidae [T]. (al)
#0426. Local feeder in stem. Hymenoptera: Cynipidae [T]. (s1)
#0766. Local feeder in stem. Hymenoptera: Cynipidae [T,P,A]. (ru)
#0681. Local feeder in stem. Hymenoptera: Cynipidae [T,A]. (al)
#0771. Local feeder in stem. Hymenoptera: Cynipidae [T]. (al)
#0787. Local feeder in stem. Hymenoptera: Cynipidae [T]. (al)
#0424. Local feeder in stem. Hymenoptera: Cynipidae: *Disholcaspis quercusmamma* [T]. (s2)
#0682. Local feeder in stem. Hymenoptera: Cynipidae: cf. *Acraspis* sp. [T]. (al)
#0725. Local feeder in stem. Hymenoptera: Cynipidae: cf. *Andricus indistinctus* [T]. (al)
#0429. Local feeder in stem. Hymenoptera: Cynipidae: cf. *Callirhytis seminator* [T]. (al)
#0427. Local feeder in stem. Hymenoptera: Cynipidae: cf. *Dryocosmus quercuspalustris* [T]. (el)
#0644. Local feeder in stem. Hymenoptera: Cynipidae: cf. *Kokkocynips* sp. [T]. (s1)
#0425. Local feeder in stem. Hymenoptera: Cynipidae: cf. *Zapatella ceropteroides* [T]. (s1)
#0724. Midrib borer. Lepidoptera [T]. (ru)
#0786. Local feeder in midrib. Hymenoptera: Cynipidae: *Acraspis erinacei* [T]. (al)
#0430. Local feeder in midrib. Hymenoptera: Cynipidae: cf. *Andricus quercuspetiolicola* [T]. (bi)
#0623. Local feeder in midrib. Hymenoptera: Cynipidae: *Amphibolips confluenta/quercusspongifica* [T]. (s1)
#0423. Local feeder in midrib. Hymenoptera: Cynipidae [T,L]. (sp)
#0428. Local feeder in midrib. cf. Cecidomyiidae: *Macrodiplosis* sp. [T]. (al)
#0621. Local feeder in petiole and stem. Diptera: Cecidomyiidae: cf. *Lasioptera* sp. [T,L]. (s1)

___
al - *Q. alba* (white oak)
bi - *Q. bicolor* (swamp white oak)
el - *Q. ellipsoidalis* (northern pin oak)
ru - *Q. rubra* (red oak)
s1 - undetermined *Q.* sp. (oak), red oak group
s2 - undetermined *Q.* sp. (oak), white oak group
sp - undetermined *Q.* sp. (oak)

Ranunculus (Ranunculaceae)

#0435. Stem borer. Coleoptera [T,L]. (hi)
#0431. Stem borer. Coleoptera: Curculionidae [T,L,A]. (ab)
#0433. Internal feeder in stem. Diptera: Agromyzidae: cf. *Phytomyza* sp. [T,L,P]. (ab)
#0434. Stem miner. Diptera: Agromyzidae: cf. *Ophiomyia* sp. [T,L,P]. (ab)
#0437. Stem miner. Diptera: Agromyzidae: *Phytomyza* sp. [T,L,P,A]. (s1)
#0432. Petiole and leaf blade miner. Diptera: Agromyzidae [T,L]. (ab)
#0436. Local feeder in petiole. Diptera: Cecidomyiidae: cf. *Neolasioptera* sp. [T,L,P,A]. (s2)

___
ab - *R. abortivus* (kidney-leaf buttercup)
hi - *R. hispidus* (hispid buttercup) (tentative ID)
s1 - undetermined *R.* sp. 1, streamside
s2 - undetermined *R.* sp. 2

Ratibida (Asteraceae)

#0438. Stem borer. Coleoptera: Mordellidae [T,L]. (pi)
#0439. Stem borer. Diptera: Agromyzidae: cf. *Melanagromyza* sp. [T,P]. (pi)
#0441. Stem (and petiole?) miner. Diptera: Agromyzidae: cf. *Ophiomyia* sp. [T,P]. (pi)

___
pi - *R. pinnata* (gray-headed coneflower)

Rhamnus (Rhamnaceae)

#0723. Miner in midrib and petiole. Lepidoptera: cf. Nepticulidae [T,L]. (ct)

___
ct - *R. cathartica* (common buckthorn)

Rhus (Anacardiaceae)

#0442. Stem borer. cf. Coleoptera: Cerambycidae: *Oberea ocellata* [T,L]. (sp)
#0443. Local feeder in rachis. Hemiptera: Aphididae: *Melaphis rhois* [T]. (sp)

___
sp - undetermined *R.* sp. (sumac)

Ribes (Grossulariaceae)

#0444. Stem borer. Hymenoptera: Cephidae: *Janus integer* [T,L]. (sp)
#0789. Borer in thorn. Undetermined [T]. (sp)
#0445. Stem miner. Lepidoptera: Opostegidae: *Opostegoides scioterma* [T,L]. (sp)
#0793. Local feeder in stem. Diptera: Cecidomyiidae [T,L]. (sp)
#0446. Local feeder in midrib. Diptera: Cecidomyiidae [T]. (sp)

___
sp - undetermined *R.* sp. (gooseberry)

Robinia (Fabaceae)

#0448. Local feeder in petiole. Diptera: Cecidomyiidae: *Resseliella* sp. [T,L,P,A]. (ps)
#0447. Internal feeder in stem. Lepidoptera: Tortricidae: *Ecdytolopha insiticiana* [T,L]. (ps)

___
ps - *R. pseudoacacia* (black locust)

Rorippa (Brassicaceae)

#0449. Miner in midrib. Diptera: Drosophilidae: *Scaptomyza* sp. [T]. (pa)

___
pa - *R. palustris* (bog yellow-cress)

Rosa (Rosaceae)

#0669. Stem borer. Hymenoptera: Cephidae [T,L]. (sp)
#0450. Local feeder in stem. Hymenoptera: Cynipidae: *Diplolepis* cf. *fusiformans* [T,L]. (bl)

#0451. Local feeder in stem. Hymenoptera: Cynipidae: *Diplolepis spinosa* [T]. (sp)

___
bl - *R. blanda* (smooth wild rose)
sp - undetermined *R.* sp. (wild rose)

Rubus (Rosaceae)

#0700. Stem borer. Lepidoptera: Noctuidae: *Papaipema* [T]. (id, oc)
#0452. Stem borer. Diptera: Anthomyiidae: *Pegomya rubivora* [T]. (sp)
#0453. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera nodulosa* [T,P,A]. (sp)

___
id - *R. idaeus* (red raspberry)
oc - *R. occidentalis* (black raspberry)
sp - undetermined *R.* sp. (raspberry)

Rudbeckia (Asteraceae)

#0465. Stem borer. Undetermined [T]. (lc)
#0463, 0704. Stem borer. Coleoptera: Erotylidae: cf. *Acropteroxys gracilis* [T,L,A]. (hi, lc)
#0455, 0469, 0703. Stem and petiole borer. Coleoptera: Mordellidae [T,L]. (hi, lc, tr)
#0458, 0464, 0466, 0467. Stem borer(s) and/or internal feeders. Diptera: Agromyzidae: *Melanagromyza rudbeckiae* et al. [T,P,A]. (lc, tr)
#0633. Stem borer. Lepidoptera: cf. Tortricidae [T,L,P]. (lc)
#0702, 0761. Stem borer. Lepidoptera [T,L]. (hi)
#0462. Stem and petiole borer. Coleoptera/Lepidoptera (cf. Noctuidae: *Papaipema* sp.) [T]. (lc)
#0459. Petiole miner/borer. Diptera: Agromyzidae: cf. *Melanagromyza* sp. [T,L,P]. (lc)
#0461, 0468. Petiole and stem miner(s). Lepidoptera: Gracillariidae: *Marmara* sp(p). [T,L,A]. (lc, tr)
#0460. Local feeder in petiole and stem. Diptera: Cecidomyiidae: *Neolasioptera rudbeckiae* [T,L,P,A]. (lc)
#0665. Local feeder in petiole. Diptera: Cecidomyiidae [T,L]. (lc)
#0454. Internal feeder(s) in stem and petiole. Coleoptera: Curculionoidea [T,L,A]. (lc)

___
hi - *R. hirta* (black-eyed susan)
lc - *R. laciniata* (cutleaf coneflower)
tr - *R. triloba* (brown-eyed susan)

Rumex (Polygonaceae)

#0470. Stem borer. Coleoptera: Curculionidae [T,L]. (sp)
#0474. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (sp)
#0472. Petiole miner. Coleoptera: Chrysomelidae: cf. *Mantura floridana* [T,L]. (sp)
#0473. Petiole borer. Lepidoptera [T,L,P]. (sp)
#0471. Internal feeder in midrib and petiole. Coleoptera: Curculionoidea: cf. Curculionidae [T,L,P,A]. (sp)

___
sp - undetermined *R.* sp. (dock)

Sagittaria (Alismataceae)

#0475. Borer in petiole and stem. Coleoptera [T,L]. (sp)

___
sp - undetermined *S.* sp. (arrowhead)

Salix (Salicaceae)

#0476. Stem borer. Hymenoptera: Cephidae: cf. *Janus abbreviatus* [T,L,P]. (ni)
#0477. Stem miner. Lepidoptera: Gracillariidae: *Marmara* sp. [T]. (ni)
#0480. Local feeder in stem. Undetermined [T]. (sp)
#0483. Local feeder in stem. Undetermined [T]. (sp)
#0651. Local feeder in stem. Coleoptera: Curculionidae [T,L]. (sp)
#0482. Local feeder in stem. Diptera: Cecidomyiidae [T]. (sp)
#0484. Local feeder in stem. Hemiptera: cf. Psylloidea [T,L]. (sp)
#0479. Local feeder in 'stem' (actually in bud). Diptera: Cecidomyiidae: *Rabdophaga rigidae* [T]. (sp)

#0481. Local feeder in 'stem' (actually in bud). Diptera: Cecidomyiidae: *Rabdophaga strobiloides* [T]. (sp)
#0478. Local feeder in petiole. cf. Hymenoptera: Tenthredinidae: *Euura* sp. [T]. (sp)

___
ni - *S. nigra* (black willow)
sp - undetermined *S.* sp. (willow)

Sambucus (Adoxaceae)

#0485. Stem borer. Coleoptera: cf. Kateretidae: *Heterhelus abdominalis* [T,L]. (ca)
#0487. Stem borer. cf. Lepidoptera: Noctuidae: *Achatodes zeae* [T]. (ca)
#0486. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Neolasioptera pierrei* [T,L]. (ca)

___
ca - *S. canadensis* (common elderberry)

Sanicula (Apiaceae)

#0493. Stem borer. Undetermined [T]. (sp)
#0488. Stem borer. Coleoptera: Curculionidae: cf. *Listronotus* sp. [T,L,A]. (sp)
#0490. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P,A]. (sp)
#0489. Miner in blade and petiole of basal leaf. Undetermined [T]. (sp)
#0491. Local feeder / miner in petiole and stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L,P,A]. (sp)
#0492. Borer in petiole. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (sp)

___
sp - undetermined *S.* sp. (sanicle, black snakeroot)

Schoenoplectus (Cyperaceae)

#0494. Stem miner. Lepidoptera: cf. Elachistidae: *Elachista* sp. [T,L]. (sp)

___
sp - undetermined *S.* sp., either *S. acutus* (hardstem bulrush) or *S. tabernaemontani* (softstem bulrush)

Scrophularia (Scrophulariaceae)

#0495, 0707. Borer(s) and/or internal feeders in petiole and stem. Diptera: Agromyzidae: at least 2 spp. incl. *Melanagromyza* sp. [T,L,P,A]. (sp)
#0497. Borer in leaf petiole (and stem?). Lepidoptera: Noctuidae: cf. *Hydraecia stramentosa* [T,L]. (sp)
#0498. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (sp)
#0499. Stem borer. Lepidoptera: Tortricidae: *Endothenia* cf. *hebesana* [T,L,P,A]. (sp)
#0772. Midrib miner. Undetermined [T]. (sp)
#0496. Local feeder in petiole and stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L,P,A]. (sp)

___
sp - undetermined *S.* sp. (figwort), either *S. lanceolata* (lance-leaf figwort) or *S. marilandica* (Maryland figwort)

Scutellaria (Lamiaceae)

#0654. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Neolasioptera* sp. [T]. (la)

___
la - *S. lateriflora* (mad-dog skullcap)

Setaria (Poaceae)

#0640. Stem borer. Diptera: Dolichopodidae: *Thrypticus* sp. [T,L,P,A]. (pu)

___
pu - *S. pumila* (yellow foxtail)

Silphium (Asteraceae)

#0504. Stem borer. Coleoptera: Curculionidae: cf. Lixinae [T,L]. (pf)
#0501, 0503, 0505, 0708. Stem borer. Coleoptera: Mordellidae: multiple spp. incl. *Mordellistena* cf. *aethiops* [T,L,A]. (in, lc, pf)
#0799. Stem borer. Diptera: Agromyzidae [T,P]. (te)
#0795. Stem and midrib/petiole borer. cf. Lepidoptera: Tortricidae: *Eucosma giganteana* [T]. (pf)
#0506. Stem miner/borer. Diptera: Agromyzidae: cf. *Melanagromyza* [T,L,P,A]. (pf)
#0502, 0507, 0508, 0709. Local feeders in stem. Hymenoptera: Cynipidae: multiple *Antistrophus* spp. [T,L,A]. (in, lc, pf)

___
in - *S. integrifolium* (rosinweed)
lc - *S. laciniatum* (compass plant)
pf - *S. perfoliatum* (cup plant)
te - *S. terebinthinaceum* (prairie dock)

Smilax (Smilacaceae)

#0509, 0658. Stem borer. Coleoptera: Mordellidae [T,L,A]. (ec, s1)
#0510. Stem miner. Lepidoptera: Gracillariidae: cf. *Marmara* sp. [T,L]. (s1)
#0511. Petiole borer. Lepidoptera [T,L]. (s2)

___
ec - *S. ecirrhata* (upright carrion flower)
s1 - undetermined *S.* sp., long herbaceous vine, apparently either *S. illinoensis* (Illinois carrion flower) or *S. lasioneura* (Blue Ridge carrion flower)
s2 - undetermined *S.* sp.

Solanum (Solanaceae)

#0512. Stem borer. Coleoptera: Curculionidae: *Trichobaris* cf. *trinotata* [T,L,A]. (cr)

___
cr - *S. carolinense* (horse nettle)

Solidago (Asteraceae)

#0518. Stem borer. Coleoptera: Mordellidae [T,L,A]. (ca, fl)
#0519. Stem borer. Diptera: Agromyzidae: *Melanagromyza* (multiple spp.?) [T,P,A]. (ca, fl)
#0515. Stem borer. Lepidoptera [T,L]. (ca)
#0517, 0629. Stem borer. Lepidoptera: Pterophoridae: *Hellinsia glenni* (+1 spp.?) [T,L,P,A]. (ca, ul)
#0513, 0520, 0525, 0528. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. (+ addl. spp.?) [T,L,P,A]. (ca, fl, sc, ul)
#0527. Midrib miner. Undetermined (cf. Agromyzidae) [T]. (ul)
#0522. Midrib and petiole miner. Lepidoptera: Gelechiidae: Gnorimoschemini [T,L]. (fl)
#0524. Local feeder in petiole. Diptera: Cecidomyiidae: *Asteromyia* sp. [T,L]. (ca, rg)
#0521. Local feeder in shoot apex. Diptera: Cecidomyiidae: *Asphondylia* sp. [T]. (fl)
#0529. Local feeder in stem. Diptera: Cecidomyiidae: *Asteromyia tumifica* [T]. (ul)
#0530. Local feeder in shoot apex. Diptera: Cecidomyiidae [T]. (ul)
#0514. Local feeder in stem. Diptera: Tephritidae: *Eurosta solidaginis* [T,L,P,A]. (ca)
#0516. Local feeder in stem. Lepidoptera: Gelechiidae: *Gnorimoschema gallaesolidaginis* [T,L]. (ca)
#0523. Local feeder in stem. Lepidoptera: Gelechiidae: *Gnorimoschema gallaeasterella* [T,P,A]. (fl)

___
ca - *S. canadensis* complex (includes *S. altissima*, *S. canadensis*, and *S. gigantea*)
fl - *S. flexicaulis* (zigzag goldenrod)
rg - *S. rigida* (stiff goldenrod)
sc - *S. sciaphila* (cliff goldenrod)
ul - *S. ulmifolia* (elmleaf goldenrod)

Sonchus (Asteraceae)

#0531. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,L,P,A]. (sp)
#0769. Local feeder in stem. Diptera: Cecidomyiidae [T,L,A]. (sp)

___
sp - undetermined *S.* sp. (sowthistle)

Spartina (Poaceae)

#0532. Stem borer. Coleoptera/Lepidoptera [T]. (pc)

___
pc - *S. pectinata* (prairie cordgrass)

Sporobolus (Poaceae)

#0533. Local feeder in stem. Hymenoptera: Eurytomidae: *Tetramesa* sp. [T,L,P,A]. (sp)

___
sp - undetermined *S.* sp. (dropseed)

Stachys (Lamiaceae)

#0620. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P,A]. (sp)
#0535. Stem borer. Lepidoptera: Tortricidae: cf. *Endothenia nubilana* [T,L]. (sp)
#0534. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (sp)
#0536. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L]. (sp)

___
sp - undetermined *S.* sp. (hedge nettle)

Staphylea (Staphyleaceae)

#0537. Local feeder in shoot apex. Diptera: Cecidomyiidae: *Dasineura* sp. [T,L]. (tr)

___
tr - *S. trifolia* (bladdernut)

Symphyotrichum (Asteraceae)

#0556, 0557. Stem borer. Undetermined (multiple spp.) [T]. (s1)
#0539. Stem borer. Coleoptera: Cerambycidae: cf. *Dectes* [T,L]. (oo)
#0540, 0558, 0648, 0679. Stem and petiole borer. Coleoptera: Mordellidae (multiple spp.?) [T,L,P,A]. (oo, pi, s2, s3)
#0542, 0551. Stem borer. Diptera: Agromyzidae [T,L,P]. (se, s4, s9)
#0544, 0549. Stem borers. Diptera: Agromyzidae: cf. *Melanagromyza* spp. (apparently 2 spp.) [T,L,P]. (s3, s6)
#0559, 0711, 0765. Stem borer. Lepidoptera: Pterophoridae: *Hellinsia glenni* [T,L,P,A]. (s1, s2, s6)
#0547. Shoot borer. Lepidoptera: cf. Bucculatricidae: *Bucculatrix cuneigera* [T,L]. (s3)
#0552. Stem miner. Diptera: Agromyzidae [T,L]. (s4)
#0560. Stem and petiole miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (s2)
#0538, 0541, 0543, 0550. Midrib and petiole miner. Diptera: Agromyzidae: *Ophiomyia astericosta* [T,P,A]. (la, oo, s3, s4)
#0800. Midrib and leaf blade miner. Diptera: Agromyzidae: *Ophiomyia carolinensis* [T,P,A]. (s8)
#0548. Midrib and petiole miner. Lepidoptera: Gelechiidae: cf. Gnorimoschemini [T,L]. (s3)
#0555. Petiole miner. Lepidoptera: cf. Bucculatricidae: *Bucculatrix* [T,L]. (s5)
#0732. Petiole and leaf blade miner. Diptera: Agromyzidae [T]. (oo)
#0545, 0553, 0777. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L]. (s3, s4, s7)
#0554. Local feeder in shoot apex. Diptera: Cecidomyiidae: *Asphondylia* sp. [T,L]. (s5)
#0546, 0710. Local feeder(s) in shoot. Diptera: Tephritidae [T,L,P]. (s3)
#0764. Local feeder in petiole. Diptera: Cecidomyiidae: cf. *Asteromyia* sp. [T]. (s6)

___
la - *S. laeve* (smooth blue aster)
oo - *S. oolentangiense* (sky blue aster)
pi - *S. pilosum* (awl aster)
se - *S. sericeum* (silky aster)
s1 - undetermined *S.* sp. (aster), linear/lanceolate leaves, in disturbed ground
s2 - undetermined *S.* sp. (aster), large wetland species, either *S. puniceum* or *S. novae-angliae*
s3 - undetermined *S.* sp. (aster), heart-leaved with leaves broad at widest point, either *S. ciliolatum*, *S. cordifolium*, or *S. drummondi*
s4 - undetermined *S.* sp. (aster), heart-leaved with leaves narrow at widest point, either *S. shortii* or *S. urophyllum*
s5 - undetermined *S.* sp., in woodland
s6 - undetermined *S.* sp. (aster), very tall cultivar in garden, heart-leaved with leaves broad at widest point, possibly either *S. ciliolatum*, *S. cordifolium*, or *S. drummondi*
s7 - undetermined *S.* sp., weedy / low conservatism, upper leaves lance-shaped, in disturbed woodland edge

s8 - undetermined *S.* sp., lanceolate leaves, quickly elongating medium-tall shoot in early summer, woodland edge
s9 - undetermined *S.* sp. (aster), lanceolate leaves, dark reddish-purple stem, disturbed ground

Taenidia (Apiaceae)

#0561. Stem borer. Coleoptera: Mordellidae [T,L,A]. (in)

___
in - *T. integerrima* (yellow pimpernel)

Taraxacum (Asteraceae)

#0712. Miner(s) in midrib, petiole, and stem. Diptera: Agromyzidae: *Ophiomyia* sp. [T,L,P,A]. (of)
#0562. Local feeder in midrib and petiole. Hymenoptera: Cynipidae: *Phanacis taraxaci* [T,L]. (of)

___
of - *T. officinale* (dandelion)

Teucrium (Lamiaceae)

#0564. Stem borer. Coleoptera: Mordellidae [T,L,P,A]. (ca)
#0569. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (ca)
#0568. Stem borer. Lepidoptera: Tortricidae: Olethreutinae [T,L,P,A]. (ca)
#0728. Stem borer. Lepidoptera: Tortricidae: cf. *Endothenia hebesana* [T,L]. (ca)
#0565. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,L,P]. (ca)
#0563. Rhizome borer. Diptera: cf. Agromyzidae [T,P]. (ca)
#0566, 0567. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. (2 spp.?) [T,L]. (ca)

___
ca - *T. canadense* (germander)

Thalictrum (Ranunculaceae)

#0571. Stem borer. Lepidoptera [T,L]. (da)
#0570. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,L,P]. (da)
#0573. Stem miner. Lepidoptera: cf. Gracillariidae: *Marmara* [T,L]. (di)
#0572. Local feeder in stem. Diptera: Cecidomyiidae: cf. *Neolasioptera* [T,L]. (da)

___
da - *T. dasycarpum* (tall meadow rue)
di - *T. dioicum* (early meadow rue)

Thlaspi (Brassicaceae)

#0574. Stem borer. Diptera: Agromyzidae: *Melanagromyza* sp. [T,P,A]. (ar)

___
ar - *T. arvense* (field pennycress)

Tilia (Malvaceae)

#0575. Local feeder in stem and petiole. Diptera: Agromyzidae: *Ophiomyia tiliae* [T,L,P]. (am)
#0762. Local feeder in stem. Diptera: Cecidomyiidae [T]. (am)

___
am - *T. americana* (basswood)

Tragopogon (Asteraceae)

#0576. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P,A]. (sp)

___
sp - undetermined *T.* sp. (goat's beard)

Trifolium (Fabaceae)

#0696. Stem borer. Coleoptera: Mordellidae [T,L]. (pr)

___
pr - *T. pratense* (red clover)

Triosteum (Caprifoliaceae)

#0577, 0578. Midrib miner. Diptera: Agromyzidae: *Phytomyza* spp. incl. *P. triostevena* [T,L,P,A]. (sp)

___
sp - undetermined *T.* sp. (horse gentian)

Typha (Typhaceae)

#0579. Stem borer. Coleoptera/Lepidoptera [T]. (sp)

___
sp - undetermined *T.* sp. (cattail)

Unassigned_phenomena (Family_unspecified)

#9001. Misc. Strange 'fungus eggs' in stems [T]. (s1)
#9002. Misc. Millipedes associated with tunneled stems [T,A]. (s2)
#9003. Misc. Borers in stems of fungi [T]. (s3)
#9004. Misc. Bees in stems [T,L,A]. (sp)
#9005. Misc. Miscellaneous herbivory of special note [T,L,P,A]. (sp)
#9006. Misc. Unassigned stem, midrib, and petiole nipping/gouging caterpillars [T,L,P,A]. (sp)

___
s1 - Campanulastrum; Galium
s2 - Chaiturus; Gentiana; Rheum
s3 - yellow ?bolete; small cap mushroom
sp - various plants

Unknown_arugula_type (Brassicaeae)

#0624. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P,A]. (sp)

___
sp - undetermined *U.* sp. (mustard family, like arugula, WH)

Unknown_bromus_type_a (Poaceae)

#0388. Local feeder in stem. Hymenoptera: Eurytomidae [T,A]. (sp)

___
sp - undetermined Poaceae sp., cf. *Bromus inermis* (smooth brome)

Unknown_bromus_type_b (Poaceae)

#0741. Local feeder in stem. Hymenoptera: cf. Eurytomidae [T,L]. (sp)

___
sp - undetermined *U.* sp. ('grass B')

Unknown_bromus_type_w (Poaceae)

#0740. Local feeder in stem. Hymenoptera: cf. Eurytomidae [T,L]. (sp)

___
sp - undetermined *U.* sp. (grass 'WH_08_10_A” without underscores)

Unknown_cyperus_type_a (Cyperaceae)

#0184. Stem borer. Coleoptera: cf. Curculionidae [T,L]. (sp)
#0183. Stem borer. Lepidoptera [T,L]. (sp)

___
sp - undetermined Cyperaceae sp. (large wetland sedge)

Unknown_fern_a (Polypodiopsida)

#0420. Borer in rachis. Undetermined [T]. (sp)

___
sp - undetermined Polypodiopsida (fern)

Unknown_fern_b (Polypodiopsida)

#0421. Borer in rachis. Hymenoptera: Tenthredinidae: cf. *Heptamelus dahlborni* [T,L]. (sp)

___
sp - undetermined Polypodiopsida (fern)

Unknown_mint_a (Lamiaceae)

#0749. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (sp)

___
sp - undetermined *U.* sp. (mint along retaining wall E of WH pond, leaves serrated and fuzzy)

Unknown_polygonum_type_a (Polygonaceae)

#0392. Stem borer. Lepidoptera: Gelechiidae [T,L,P,A]. (sp)

___
sp - undetermined Polygonaceae sp., finely hairy stems and leaves, wetland habitat

Unknown_prairie_grass_a (Poaceae)

#0389. Local feeder in stem. Diptera: Cecidomyiidae: *Calamomyia* sp. [T,L,P,A]. (sp)

___
sp - undetermined Poaceae sp., in remnant prairie

Urtica (Urticaceae)

#0588. Stem borer. Coleoptera: Curculionoidea [T,L]. (di)
#0586. Stem borer. Coleoptera: Mordellidae [T,L]. (di)
#0581, 0582, 0583, 0584. Stem borers. Diptera: incl. Agromyzidae: *Melanagromyza martini*, *M. urticae*, and *Phytomyza flavicornis*, + 1 addl. sp. [T,L,P,A]. (di)
#0585. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (di)
#0587. Stem borer. Coleoptera/Lepidoptera [T]. (di)
#0768. Stem miner. Undetermined [T]. (di)
#0763. Local feeder in shoot tip. Diptera: Cecidomyiidae [T]. (di)

___
di - *U. dioica* (stinging nettle)

Vaccinium (Ericaceae)

#0589. Local feeder in stem. Hymenoptera: Pteromalidae: *Hemadas nubilipennis* [T,A]. (an)

___
an - *V. angustifolium* (lowbush blueberry)

Verbena (Verbenaceae)

#0590, 0592, 0594. Stem borer. Diptera: Agromyzidae: *Melanagromyza verbenivora* [T,L,P,A]. (ha, st, ur)
#0591, 0593, 0595. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,L,P,A]. (ha, st, ur)
#0596. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L,P,A]. (ur)

___
ha - *V. hastata* (blue vervain)
st - *V. stricta* (hoary vervain)
ur - *V. urticifolia* (white vervain)

Vernonia (Asteraceae)

#0597. Stem borer. Coleoptera/Lepidoptera [T]. (fa)

___
fa - *V. fasciculata* (ironweed)

Veronica (Plantaginaceae)

#0598. Stem borer. Diptera: Chironomidae: *Metriocnemus erythranthei* [T,L,P,A]. (an)
#0599. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp., cf. *P. nelita* [T,L,P,A]. (an)

___
an - *V. anagalis-aquatica* (veronica)

Veronicastrum (Plantaginaceae)

#0603. Stem borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (vi)
#0601. Stem borer. Lepidoptera: Tortricidae: cf. *Endothenia* [T,L,P,A]. (vi)
#0602. Stem miner. Lepidoptera: Gracillariidae: cf. *Marmara* [T,L]. (vi)
#0600. Local feeder in stem. Diptera: Cecidomyiidae [T,L]. (vi)

___
vi - *V. virginicum* (Culver's root)

Viburnum (Adoxaceae)

#0604. Stem borer. Hymenoptera: Cephidae: cf. *Janus bimaculatus* [T,L]. (le)
#0605. Stem miner. Lepidoptera: cf. Gracillariidae: *Marmara* [T]. (le)

___
le - *V. lentago* (nannyberry)

Viola (Violaceae)

#0718. Petiole borer. Lepidoptera: Noctuidae: *Papaipema* sp. [T,L]. (sp)
#0683. Petiole miner/borer. Diptera: Cyclorrhapa [T,L,P]. (sp)
#0606. Local feeder in petiole. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L]. (sp)
#0714. Internal feeder in rhizome. Diptera: Chloropidae [T,L,P,A]. (sp)

___
sp - undetermined *V.* sp. (violet)

Vitis (Vitaceae)

#0607, 0608. Internal feeders in stem (2 spp.). Coleoptera: Curculionidae: cf. *Ampeloglypter ampelopsis* and *A. sesostris* [T]. (sp)
#0609. Local feeder in petiole and stem. Diptera: Cecidomyiidae: cf. *Neolasioptera vitinea* [T,L]. (sp)
#0757. Local feeders in petiole and stem. Diptera: Cecidomyiidae: multiple spp. [T,L,P,A]. (sp)

___
sp - undetermined *V.* sp. (wild grape)

Xanthium (Asteraceae)

#0611. Stem borer. Coleoptera: Curculionoidea: cf. Curculionidae: *Rhodobaenus* [T,L]. (st)
#0610. Stem borer. Diptera: Agromyzidae: *Melanagromyza virens* sp. grp. [T,L,P,A]. (st)

___
st - *X. strumarium* (cocklebur)

Yucca (Asparagaceae)

#0612. Stem borer. Lepidoptera: Prodoxidae: *Prodoxus* sp. [T,L,P,A]. (sp)

___
sp - undetermined *Y.* sp. (yucca)

Zanthoxylum (Rutaceae)

#0613. Local feeder in stem. Diptera: Cecidomyiidae: *Neolasioptera* sp. [T,L]. (am)

___
am - *Z. americanum* (prickly ash)

Zinnia (Asteraceae)

#0690. Stem borer. Diptera: Agromyzidae: cf. *Melanagromyza* [T,P]. (el)

___
el - *Z. elegans* (zinnia)

Zizia (Apiaceae)

#0619. Stem borer. Coleoptera: Mordellidae [T,L]. (au)
#0614, 0615. Stem borers. Diptera: Agromyzidae: at least 2 *Melanagromyza* spp. [T,P,A]. (au)
#0618. Stem borer. Lepidoptera: Noctuidae: *Papaipema rigida* [T,L,P,A]. (au)
#0616. Stem miner. Diptera: Agromyzidae: *Ophiomyia* sp. [T,P]. (au)
#0617. Local feeder(s) in petiole and stem. Diptera: Cecidomyiidae: Lasiopteridi (2 spp.?) [T,L,P,A]. (au)

___
au - *Z. aurea* (golden alexanders)

###

TEXT DESCRIPTIONS OF RECORDS

This section provides written descriptions for certain records from the "List of Records" section, above. It is grouped by host plant genus. For each entry, the record number and host genus are given in square brackets followed by the text description and any references.

If a host genus is listed with no descriptions, it is a genus in which I did record one or more stem-dwelling insects, as outlined in the "List of Records" section above, but for which I have not yet written the record descriptions. I hope to eventually add descriptions for all records.

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Abutilon

[0653 - Abutilon]
A dead stem I examined in winter had had its lowermost portion hollowed out by an unknown insect when the stem was alive during the previous growing season. The tunneling presumably extended into the roots, but I did not observe this directly. The culprit was no longer present.
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[0001 - Abutilon]
The larva mines shallowly in the stem, creating blister-like raised patches of mined tissue that may split, scar, and/or become distorted. The puparium is formed just under the stem epidermis, and it may be partially exposed if the epidermis splits open. After the adult emerges, the empty puparium is a pale whitish color. Adults I reared, which were confirmed as *O. abutilivora* (Eiseman et al. 2021), emerged in late July.
...
Eiseman, C.S., Lonsdale, O., van der Linden, J., Feldman, T.S., and M.W. Palmer. 2021. Thirteen new species of Agromyzidae (Diptera) from the United States, with new host and distribution records for 32 additional species. Zootaxa 4931(1): 1–68.

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Acalypha

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Acer

[0000 - Acer]
I have found Lepidoptera larvae belonging to two different families tunneling in *Acer* shoots in spring: a nepticulid (record {0007}) and one or more tortricids ({0002, 0005}). Among other ways to tell them apart, the tortricid larvae are much larger at maturity, and consequently the volume of their tunneling in the shoot is much greater (probably by at least an order of magnitude) than that of the nepticulid. As with other woody plants, I have spent comparatively little time with the wood borers (Lepidoptera or otherwise) of this host genus, but for an interesting example of a woodpecker harvesting a cossid borer larva (Lepidoptera: Cossidae) from a branch of a ?maple tree, see BetCrooks (2016).
...
BetCrooks [username]. 2016. Yellow larva red dots. Contributor post at BugGuide.net. Retrieved July 28, 2025 from [URL : https://bugguide.net/node/view/1196949 : end URL].

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[0007 - Acer]
This nepticulid tunnels in new shoots of sugar maple in May, causing the leaves to wilt. The damage appears to be typically confined to the base of the shoot, where the shoot emerges from last year's woody twig, with tunnels observed extending into the shoot several mm
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toward the shoot apex from this point. At the time of larval activity, the very base of the shoot is surrounded by persistent bud scales. In one example I collected for study, removing these bud scales revealed discoloration of the shoot base associated with the larva's tunneling and an entrance hole in the outer wall of the shoot, plugged with frass and leading to the tunnel within.

I obtained two cocoons in my efforts to rear this borer. The first cocoon was formed on the exterior of the woody twig ~20mm below where the shoot tunneling had occured. The second was formed in the open end of a tunneled shoot that had been removed from the woody portion of the twig so it would fit in the rearing container. Both cocoons were completed on or before May 21, and an adult emerged from the first cocoon on 11 June.

Etainia ochrefasciella (formerly *Obrussa ochrefasciella*) is known to feed in terminal buds of sugar maple in springtime. Kulman (1967) described the life history of this species in detail. According to Kulman, eggs are laid on leaf petioles in summertime, which the newly hatched larvae tunnel into briefly before moving into the adjacent axillary buds. The following spring, larvae migrate to terminal buds, where they complete their development; pupation is in a cocoon off the plant. Kulman found larvae only in petioles and buds, but located evidence of insects tunneling in new shoots in the springtime as well:

"In Florida, several shoots of southern sugar maple, about 1/8 inch in diameter, were damaged by an unknown borer which bored for more than 1 inch in the center of the current year's shoot. Each boring was associated with a dead axillary bud which was not at the twig terminal. ... Studies are presently in progress on insects boring in expanding shoots of sugar maple. There is little chance that the damage just described could be confused with that caused by the hard maple bud miner. The *Obrussa* larva attacks only the buds, and usually leaves the bud scales intact. (ibid., p. 390)"

It is possible that my finding of a nepticulid tunneling in new shoots represents the mystery insect whose sign Kulman found in Florida. The simplest explanation is that the shoot borer is also *E. ochrefasciella* but Kulman did not find inhabited shoots and rear larvae from them to adulthood, so he was unaware the species feeds in shoots as well as buds and petioles. The *E. ochrefasciella* larvae may simply sometimes fail to kill the bud prior to its opening, their feeding only resulting in the death of the vegetation after the shoot has elongated several centimeters and leaves have unfurled. Another (less likely?) possibility is that the shoot borer is a different species. Eventual examination of the reared adult from the current study will hopefully shed light on the situation.
...
Kulman, H.M. 1967. Biology of the hard maple bud miner, *Obrussa ochrefasciella*, and notes on its damage (Lepidoptera: Nepticulidae). Annals of the Entomological Society of America 60(2): 387–391.

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[0002, 0005 - Acer]
In June 2023, I located larvae in a silver maple tree and a boxelder tree growing only about 200 feet from one another, and I reared the larvae to adulthood. I photographed additional examples from two locations in 2022 and 2023 but did not attempt to rear the larvae.

Both leaf petioles and stems of current-year shoots on the host trees may be tunneled. In one of the examples from boxelder that I found in early June 2022, the main stem was the feeding site and it was distorted into a gall-like swelling. In the examples collected for rearing in 2023, the stem of the shoot was again the main feeding site in both silver maple and boxelder, and in boxelder the larva's tunnel extended into a leaf petiole, with the base of the petiole becoming slightly swollen, and with frass being ejected through a small hole in the petiole base and accumulating in a noticeable wad on the petiole exterior. Similarly, a silver maple petiole inhabited by a young larva in late May was slightly swollen due to the larva's presence.

Reared larvae finished their tunneling in the main stem of the shoot by mid-June. The individual from silver maple pupated in a large agglomeration of wet black frass at the
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terminus of the affected shoot, while the boxelder larva pupated off the plant in a silk cocoon spun on the side of the rearing container. Adults emerged at the end of June. At least four species of *Proteoteras* are recorded from stems of *Acer* (Gallformers Contributors 2023a-e; Solomon 1995) and it is not known how many of them may be involved in the observations just described.
...
Solomon, J.D. 1995. Guide to insect borers in North American broadleaf trees and shrubs. USDA Forest Service Agriculture Handbook AH-706.

Gallformers Contributors. 2023a. "Proteoteras aesculana," notes on ID and taxonomy. Gallformers website, www.gallformers.org. Retrieved December 6, 2023 from [URL : https://gallformers.org/gall/547 : end URL].

Gallformers Contributors. 2023b. "Proteoteras crescentana," notes on ID and taxonomy. Gallformers website, www.gallformers.org. Retrieved December 6, 2023 from [URL : https://gallformers.org/gall/1962 : end URL].

Gallformers Contributors. 2023c. "Proteoteras moffatiana," notes on ID and taxonomy. Gallformers website, www.gallformers.org. Retrieved December 6, 2023 from [URL : https://gallformers.org/gall/1965 : end URL].

Gallformers Contributors. 2023d. "Proteoteras willingana," notes on ID and taxonomy. Gallformers website, www.gallformers.org. Retrieved December 6, 2023 from [URL : https://gallformers.org/gall/539 : end URL].

Gallformers Contributors. 2023e. Source no. 234. Gallformers website, www.gallformers.org. Retrieved December 6, 2023 from [URL : https://gallformers.org/source/234 : end URL].

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[0779 - Acer]
In 2026, I found a *Marmara* mine on a young boxelder twig in the winter, after it had already apparently been evacuated by the larva in the previous growing season. The mine was at least a decimeter in total length and widened considerably along its length as it wound up and down the twig. It was white in color compared to the darker color of the unaffected bark. The twig was a vigorous sprout from the main trunk of the tree, about six feet above ground level.

I had been alerted to the presence of such mines in North America years ago by T. Feldman (pers. comm.), but for a long time did not find one, and had suspected they were not present in my study area...incorrect, as it turned out. The following external links on BugGuide (not my own) provide good photographic information about the life history of this species:

- Stem mine: https://www.bugguide.net/node/view/1502839
- Stem mine: https://www.bugguide.net/node/view/2245769
- Larva in mine: https://www.bugguide.net/node/view/2164978
- Larva in mine, with central frass line: https://www.bugguide.net/node/view/2163306
- Exit slit: https://www.bugguide.net/node/view/2245776
- Exit slit: https://www.bugguide.net/node/view/1784421
- Cocoon: https://www.bugguide.net/node/view/2167230

The photos in all of the BugGuide links above were taken by T. Feldman (Feldman 2018, Feldman 2020, Feldman 2022a-c, Feldman 2023a-b). Note that in the 2022 photos, the larva finished feeding, exited the mine, and pupated around August 20 and the adult emerged in the first days of September.
...
Feldman, T. 2018. Willy Duke Bluffs stem miner maybe on Acer negundo D898 2018 1 - *Marmara*. Contributor post on BugGuide.net. Retrieved January 25, 2026 from [URL : https://www.bugguide.net/node/view/1502839 : end URL].
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Feldman, T. 2020. Willy Duke Bluffs stem miner on Acer negundo D2042 2020 6 - *Marmara*. Contributor post on BugGuide.net. Retrieved January 25, 2026 from [URL : https://www.bugguide.net/node/view/1784421 : end URL].

Feldman, T. 2022a. New Hope Bottomlands stem miner on Acer negundo D4056 Marmara 2022 5 - *Marmara*. Contributor post on BugGuide.net. Retrieved January 25, 2026 from [URL : https://www.bugguide.net/node/view/2163306 : end URL].

Feldman, T. 2022b. New Hope Bottomlands stem miner on Acer negundo D4056 Marmara 2022 11 - *Marmara*. Contributor post on BugGuide.net. Retrieved January 25, 2026 from [URL : https://www.bugguide.net/node/view/2164978 : end URL].

Feldman, T. 2022c. New Hope Bottomlands stem miner on Acer negundo D4056 Marmara cocooon 2022 2 - *Marmara*. Contributor post on BugGuide.net. Retrieved January 25, 2026 from [URL : https://www.bugguide.net/node/view/2167230 : end URL].

Feldman, T. 2023a. Mason Farm stem miner Marmara on Acer negundo D4455 2023 1 - *Marmara*. Contributor post on BugGuide.net. Retrieved January 25, 2026 from [URL : https://www.bugguide.net/node/view/2245769 : end URL].

Feldman, T. 2023b. Mason Farm stem miner Marmara on Acer negundo D4455 2023 4 - *Marmara*. Contributor post on BugGuide.net. Retrieved January 25, 2026 from [URL : https://www.bugguide.net/node/view/2245776 : end URL].

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[0006 - Acer]
The maple petiole borer sawfly (Hymenoptera: Tenthredinidae: *Caulocampus acericaulis*) is one of the better-known petiole borers in North America. According to Britton (1906), records of damage probably due to this species appear as early as 1895 in the entomological literature. Britton reared adults, briefly described the immature and adult forms, and provided perhaps the first relatively comprehensive account of this animal's life history, including black-and-white photographs of affected leaves and and egg and a larva inside petioles. Yuasa's monograph on Tenthredinoidea larvae (Yuasa 1922) describes the larva of *C. acericaulis* in more detail. Smith (1968) reviews the genus and describes a second species, *C. matthewsi*, including the information that "the specimens [of *C. matthewsi*] were collected in a Malaise trap, and the host is not known; however, judging from the structure of the lancet, the habits of *matthewsi* may be similar to those of *acericaulis*. Both species of this genus were collected in the same locality" (p. 129). In addition to those works, descriptions of *C. acericaulis* biology and plant damage may be found in recent printed sources (e.g. Cranshaw 2004) and in entomology publications on the Web.

In the current study, I detected the presence of *Caulocampus* maple petiole borer sawfly larvae by observing fallen leaf blades of sugar maple (*Acer saccharum*) in late May through the first week of June, 2018 and 2023. The sawfly larvae, feeding inside the petioles of these leaves up in the tree, had neatly severed the petioles about 1 to 3 cm below the leaf blade. The leaf blade of each affected leaf, with a short stub of petiole attached, had then fallen to the ground, and the rest of the petiole -- with larva still feeding inside -- remained attached to the tree. Searching the lower branches of the trees soon revealed the remnant petioles still attached to the green stems.

The larva tunnels out part of the remaining length of its petiole, producing dark brown frass with which it plugs the open end of the petiole. Larvae are straw-colored, with six short, fleshy thoracic legs (visible with minimal magnification) and a slightly darker head capsule bearing two small dark eyespots and sclerotized mandibles. I observed one particularly robust larva, which I believed to be a final instar, produce a strong, sickly-sweet lemony scent. The odor was noticeable at least 30 cm away from the source.

When mature, the larva exits the petiole and burrows into the soil to pupate. Adults reared by Britton (ibid.) emerged the following spring when maple leaves were just beginning to unfurl.
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...
Britton, W.E. 1906. The maple leaf-stem borer or sawfly, *Priophorus acericaulis* MacGillivray, a new enemy of the sugar maple. Entomological News 17:313-320. Retrieved September 9, 2023 from [URL : https://www.biodiversitylibrary.org/page/24669971 : end URL].

Cranshaw, W. 2004. Garden insects of North America. Princeton University Press: Princeton and Oxford.

Smith, D.R. 1968. The genus *Caulocampus* Rohwer. Proceedings of the Entomological Society of Washington 70(2):126-129. Retrieved September 9, 2023 from [URL : https://www.biodiversitylibrary.org/page/16262135 : end URL].

Yuasa, H. 1922. A classification of the larvae of the Tenthredinoidea. Illinois Biological Monographs 7(4):1-172. Retrieved September 9, 2023 from [URL : https://www.biodiversitylibrary.org/page/16565277 : end URL].

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[0003 - Acer]
This local feeder forms a large succulent gall on the midrib of a leaflet. The culprits had already evacuated one gall I observed in early June. The gall keys to *Contarinia negundinis* in Gagné (1989), and its characteristics are also consistent with those described for *C. negundinis* in Gallformers Contributors (2024a).
...
Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

Gallformers Contributors. 2024a. "Contarinia negundinis," notes on ID and taxonomy. Gallformers website, www.gallformers.org. Retrieved June 22, 2024 from [URL : https://gallformers.org/gall/540 : end URL].

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[0641 - Acer]
This record represents a small petiole swelling, less than 1 cm in diameter, of which I have found a single example. The culprit was gone and an exit hole was present when I observed the gall in late October. Multiple whitish mites inhabited the gall interior; I assumed they were inquilines who entered through the original inhabitant's exit hole. Considering that I found larvae of *Proteoteras* (Tortricidae) (record {0002, 0005}) making somewhat similar damage to petioles of silver maple at the same location in June, it is possible this gall could be an aborted example of *Proteoteras* herbivory. The *Proteoteras* feeding in petioles generally seemed to involve an elongate tunnel that led from the swollen petiole into the main stem, and thus was not limited only to the swollen part of the petiole, whereas the internal hollowing in this gall was confined exclusively to the swollen area.
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[0643 - Acer]
This tentative record refers to a possible cecidomyiid affecting petioles of silver maple. In the only example I observed, a ~40-mm length of petiole tissue was externally blackened and slightly sunken (with no visible swelling); under the epidermis was an elongate tunnel, appearing as if divided into two tunnels positioned end-to-end. The proximal / lower end of the tunnel contained a slightly enlarged chamber with a small amount of whitish fungal growth, while the distal end, also slightly enlarged, contained a thin-walled whitish object, which I believed to be the remnants of a cecidomyiid cocoon. Though larvae were not present when I observed the petiole in late October, the size, length, and color of the tunnel, the whitish cocoon-like object, and the blackening and sunkenness of the petiole exterior were all consistent with *Neolasioptera* sign I encountered on stems and stemlike structures of other plants during the course of the survey. I examined approximately 200 additional petioles of fallen leaves from the same tree without locating a second example of
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this local feeder. Further investigation would be required to confirm that a cecidomyiid is responsible for the plant damage observed.
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Achillea

[0010 - Achillea]
In late April, I located two dead stems each inhabited by a larva of this borer, after the stems had overwintered in the field. The affected stems belonged to plants grown in a garden bed.

In each case, the larva had hollowed out an area roughly 30cm in length in the middle part of the stem, with frass packed tightly in the upper end of the tunnel to a length of several centimeters. The part of the tunnel in which I found the larva was entirely devoid of frass and it was clear the larva had moved most or all frass to the top of the tunnel. At least one tunnel ended at its bottom with a rod of compacted frass approximately 10-15mm in length. Both tunnels ended neatly well above the base of the stem, with solid undisturbed pith below them all the way down to ground level.

A larva from one of the tunnels was an almost shockingly vibrant orange color. It prepared a ~20mm-long pupation chamber in its tunnel, bounded on both ends by wads of frass, and emerged as an adult in mid-May through an oval hole in the wall of the stem at the top of the pupation chamber. The color pattern of the adult appears consistent with *Acropteroxys gracilis* (see, e.g., VanDyk 2025a).
...
VanDyk, J., ed. 2025a. Species *Acropteroxys gracilis* - Slender Lizard Beetle. Species page at BugGuide.net. Retrieved July 28, 2025 from [URL : https://bugguide.net/node/view/17702/bgimage : end URL].

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[0011 - Achillea]
I found a mordellid larva in a partially frass-filled tunnel in an overwintered dead stem of the host in mid-May. It pupated in the stem, and the adult emerged by mid-June. The larva and pupa were a pale whitish color, with the maturing pupa developing dark eyes, and the adult was a rather nondescript grayish-black color except for a faint reddish wash behind the head.

Mordellistena cervicalis, *M. pulchra*, and *Mordellina pustulata* have all been reared from stems of this host in Wisconsin (Lisberg & Young 2003). Of these, both *M. cervicalis* and *M. pulchra* may have some reddish coloration on the head and prothorax, according to Liljeblad (1945), which is also a characteristic of my reared adult, but the details of the exact colors involved (which Liljeblad variously referred to as "rufous," "ferruginous," and "reddish yellow") and their extent and patterning differ between those two species (Liljeblad, ibid.), along with other characteristics I have not attempted to compare with my reared adult. Not far from where I collected the larva that gave rise to my adult, Hatfield (2017) collected an adult mordellid with coloration very similar to mine, and she identified her specimen as *M. cervicalis* based on the leg ridges.
...
Hatfield, MJ. 2017. Mordellidae, lateral - *Mordellistena cervicalis*. Contributor post at BugGuide.net. Retrieved July 29, 2025 from [URL : https://bugguide.net/node/view/1335714 : end URL].

Liljeblad, E. 1945. Monograph of the family Mordellidae (Coleoptera) of North America, north of Mexico. Miscellaneous publications, Museum of Zoology, University of Michigan, no. 62.

Lisberg, A.E. and D.K. Young. 2003. An annotated checklist of Wisconsin Mordellidae (Coleoptera). Insecta Mundi 17(3-4): 195-202.

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[0008 - Achillea]
I observed agromyzid larvae to tunnel in aerial stems of the host and also in the petiole and crown of a rosette.

Larval activity in stems in early June sometimes caused the stem to wilt, due to the larva establishing a short, shallow tunnel around the upper stem in a spiral pattern, then penetrating into deeper tissues. A stem-boring larva I found on June 20 one year was nearly mature, and in another year, larvae in stems formed puparia as early as June 13, with an adult emerging before early August. Also, in both 2020 and 2023, I found a spent agromyzid puparium in a tunnel in a dead stem of the host during the winter, but was unable to determine the identity of these puparia beyond family level.

I discovered the activity in rosettes of the host by observing wilting and/or shriveling rosette leaves. Looking closer at one of the affected rosettes, I found that an agromyzid larva had hollowed out the crown of the rosette along with the base of the petiole of one of the wilted leaves. The straw-colored puparium was formed in the interior of the base of the petiole, and the adult emerged in September.
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[0009 - Achillea]
The observed leaf mine extended ~25 mm along the midrib and entered one of the lobes of the leaf; the lobe had turned brown due to the mining. The larva had abandoned the plant material by the time I located the mine in mid-June. With the frass deposited mostly in strips or beaded strips, this keys to *Liriomyza* sp. in Eiseman (2019).
...
Eiseman, C.S. 2019. Leafminers of North America, 1st edition. Self-published e-book. Available from the author at [URL : https://charleyeiseman.com/leafminers/ : end URL].

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Actaea

[0012 - Actaea]
The larva of this agromyzid tunnels and pupates in the lower stem. I reared an adult from an overwintered puparium. The posterior spiracular plates of the puparium were separated by approximately their own width, and they each possessed a straight horn about half as long as the width of the plate. Large species (puparium length ~4-5mm).
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[0013 - Actaea]
I found extensive mining wrought by this insect on a lower stem of the host in early October, by which time the culprit was absent. The long, winding linear mines were a brown color, with a dark central line of frass. The mine characteristics are consistent with *Marmara* sp., but I did not observe the larva directly.
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Aegopodium

[0734 - Aegopodium]
- Mines found on the upper stems of plants growing in a garden bed in late July
- Included both whitish and brown discoloration
- No obvious black splotches of frass; only a few areas noted in the mine with indistinct wisps of faint greenish or brownish frass
- Mine reached up to within 1 cm of base of umbel
- At least two puparia noted; one was yellowish-green, the other black
- Puparia were formed under the epidermis with black anterior spiracles protruding
- Apparently *Ophiomyia* based on characteristics of mine and puparium
- Interestingly, *Aegopodium podagraria* is native to Europe and not the U.S. (Waggy 2010), but the Plant Parasites of Europe website reports only *Phytomyza* spp. leafminers among the agromyzid miners known from this host genus in Europe (Ellis 2026)
...
Ellis, W.N. 2026. Aegopodium. In Plant Parasites of Europe [website]. Retrieved January 25, 2026 from [URL : https://bladmineerders.nl/host-plants/plantae/spermatopsida/angiosperma/eudicots/superasterids/asterids/campanulids/apiales/apiaceae/apioideae/careae/aegopodium/ : end URL].

Waggy, M.A. 2010. Aegopodium podagraria. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Retrieved January 25, 2026 from [URL : https://www.fs.usda.gov/database/feis/plants/forb/aegpod/all.html : end URL].

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Aesculus

[0014 - Aesculus]
I found larvae tunneling in petioles of new leaves in spring. Their activity caused the leaflets to shrivel and the leaf above the tunneled area to droop conspicuously. The petiole sometimes discolored and/or became slightly distended, and a hole was sometimes visible in the petiole wall, through which the larva evidently expelled frass. Inhabited leaves eventually fell to the ground, and larvae completed their development by exiting the petiole and feeding on the leaflets, which they tied together with silk, further fortifying the shelter already established by the complex infolded architecture of the shriveled leaf blade tissue. Adults emerged in June. S. Nanz and M. Sabourin reviewed photos of the adults (Nanz 2019), and Eiseman's (2014) images of larval damage, and also an adult he reared that was examined by J. Brown to confirm its identity, provided a helpful point of comparison.
...
Eiseman, C.S. 2014. Buckeye petiole borer. BugTracks weblog. Retrieved July 3, 2024 from [URL : https://bugtracks.wordpress.com/2014/09/19/buckeye-petiole-borer/ : end URL].

Nanz, S. 2019. Comment on contributor post at BugGuide.net. Retrieved July 3, 2024 from [URL : https://bugguide.net/node/view/1234456 : end URL].

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Agastache

[0016 - Agastache]
Larvae occurred in partially frass-filled hollows in overwintered stems of the host in April, and an adult emerged in May. The patchy golden mottling on the elytra is consistent with *M. pustulata*, but this identification has not yet been confirmed.
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[0017 - Agastache]
The lower stems of the host are hollow except for an inner lining of pith. I found a puparium at the end of a tunnel in this pith layer in a lower stem, with the majority of the larva's tunneling having occurred at the base of the stem and apparently also in the plant crown and/or roots (although the belowground parts of the plant were not examined). Since I found the puparium intact in October, adults most likely emerge in spring. The posterior spiracular plates of the puparium bear upturned horns that are approximately half as long as the width of the plates.
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[0015 - Agastache]
Affected stems, observed in mid-July, showed long narrow linear mines up and down their length, as well as localized areas in the upper stems that were more intensively mined. The long narrow linear mines were extremely thin and slightly raised above the surrounding tissue, and they were a greenish color with frass not easily visible. There was a bulging, gall-like distortion to the stem tissue in the more intensively mined localized areas in the upper stem. It appeared that larvae had constructed the long narrow linear mines lower on the plant when they were younger, and finished their development in the localized blisters in the upper stems. Pupation occurred off the plant in an oval, rusty-colored cocoon. I reared adults in mid-August from larvae collected in mid-July.
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[0018 - Agastache]
I located a parasitized puparium under the epidermis at the end of a stem mine on a dead stem of the host in January. The puparium was located immediately below the base of the seedhead. *O. mimuli* has been previously reared from *A. nepetoides* in Illinois (Eiseman 2022, p. 1720).
...
Eiseman, C.S. 2022. Leafminers of North America, 2nd edition. Self-published e-book. Available from the author at [URL : https://charleyeiseman.com/leafminers/ : end URL].

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Ageratina

[0000 - Ageratina]
I have found more species of internal stem herbivores in white snakeroot (*Ageratina altissima*, the sole wild representative of the genus *Ageratina* in the study area) than in any other herbaceous plant I've studied. White snakeroot is the only herb from which I have reared two species of cerambycid stem borer (records {0675} & {0019}, below). Co-occurence of two species of mordellid borer in a single hostplant species (records {0021} & {0727}) has also been reported for other hosts in the literature: for example, *Mordellistena

convicta* cryptic spp. 1 & 2 in stems and/or galls of *Solidago gigantea* and *S. altissima* (Abrahamson et al. 2003); mordellids including *Mordellina pustulata* from *Gentiana andrewsii* (Williams 1999; Lisberg & Young 2003); and at least two *Mordellistena* and/or *Mordellina* spp. each from stems of *Ambrosia trifida* and *A. artemisiifolia*, *Aster vimineus*, *Cirsium vulgare*, *Elephantopus carolinianus*, *Eupatorium serotinum*, *Solidago canadensis*, *Verbesina alternifolia*, and *Xanthium strumarium* (Ford & Jackman 1996).

Stem galls formed in the upper stems of white snakeroot need to be examined carefully in order to successfully determine their identities, because at least three different insects form somewhat similar galls. Galls of *Asphondylia eupatorii* (record {0632}) may be formed in the upper stem, similar to the *Neolasioptera* gall described in record {0022}. However, adults of the *Asphondylia* emerge before winter (Gagné 1989), with exit holes sometimes visible on the evacuated galls late in the season (but Gagné [pers. comm., March 16, 2025] notes that such holes may sometimes be produced by exiting parasitoids). In addition, the single *Asphondylia* gall I observed housed its multiple larvae in relatively broad ovoid chambers, while larvae from the upper and lower stem *Neolasioptera* galls occurred either with little visible disturbance to the pith or in short, narrow, cylindrical tunnels. *Eutreta* sp. (Tephritidae) (record {0024}) galls that I found were always located at a node on the stem, and the large, pale whitish or yellowish, anteriorly tapered maggot occurs singly, hollowing out the gall interior and forming its robust, pill-shaped puparium there, with the adult emerging before winter and the gall sometimes splitting open after the adult emerges, exposing the empty puparium.

Future work with the stem feeders of white snakeroot could focus on several areas, such as identifying the lepidopteran stem miner (record {0026}), rearing the *Resseliella* ({0032}), and elucidating whether all tephritid borer larvae ({0029}) belong to *Strauzia rugosum*. It would also be helpful to clarify the trophic role of the eurytomid ({0023}) and determine whether the diversity of apparent or confirmed *Neolasioptera* galls ({0022}) are all created by a single species.
...
Abrahamson, W. G., Blair, C. P., Eubanks, M. D., and S.A. Morehead. 2003. Sequential radiation of unrelated organisms: the gall fly *Eurosta solidaginis* and the tumbling flower beetle *Mordellistena convicta*. Journal of Evolutionary Biology 16(5): 781-789.

Ford, E.J. and J.A. Jackman. 1996. New larval host plant associations of tumbling flower beetles (Coleoptera: Mordellidae) in North America. The Coleopterists' Bulletin 50(4): 361-368.

Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

Lisberg, A.E. and D.K. Young. 2003. An annotated checklist of Wisconsin Mordellidae (Coleoptera). Insecta Mundi 17(3-4): 195-202.

Williams, A.H. 1999. Fauna overwintering in or on stems of Wisconsin prairie forbs. Proceedings of the North American Prairie Conference 16: 156-161.

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[0675 - Ageratina]
I found a single larva of this borer in late March, overwintering in a dead stem of the host that was approximately 90-100cm tall and ~4mm in diameter at the base. The larva had tunneled out nearly the entire length of the stem, with the tunnel extending from the base of the stem up to about 10-15cm below the stem tip. Sections of the tunnel were filled with rods of compacted frass; two of these rods measured 8.5cm long and 7.2cm long. The compacted rods of frass alternated with stretches of open tunnel with variously smooth or slightly rough walls. The frass consisted of fine, neatly round pellets, reminiscent of the pellets produced by cerambycid borers in other plants I've examined. When it was ready to pupate, the larva prepared a chamber ~15cm long in the stem, the chamber itself completely cleared of frass but bounded on both ends by frass rods along with an accumulation of shavings. The adult emerged in early May, and Richards (2024) identified it from photos.
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...
Richards, B. 2024. Comment on contributor post at BugGuide.net. Retrieved July 6, 2024 from [URL : https://bugguide.net/node/view/2354008 : end URL].

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[0019 - Ageratina]
The larva of this borer, upon finishing its tunneling in the stem of the host, makes a cut around the inner circumference of the lower stem, causing the stem above this point to break off. The larva, still inside the remaining stem stump, then seals the open end of the stump with shavings and frass. Pupation is in a chamber in the stem stump below the plugged end. Chapman (2018) identified the adult I reared.
...
Chapman, E. 2018. Comment on contributor post at BugGuide.net. Retrieved July 2, 2024 from [URL : https://bugguide.net/node/view/1559958 : end URL].

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[0020 - Ageratina]
I found several *A. gracilis* larvae overwintering in their tunnels in dead stems of the host (one larva per stem). These larvae had accomplished most of their feeding while the stems were still alive and/or in the process of senescing during the previous summer and fall. I also found one larva in a living stem in August. All of the larvae were orangish in color, with relatively well-developed thoracic legs and a pair of sharply pointed, curved urogomphi on the posterior end.

The tunnel of a typical overwintering larva often extended along much of the length of the stem. Stretches of the tunnel were smooth-walled and clear of frass, while other regions of the tunnel were tightly packed with long rods of compacted frass. I usually found the larva in the lower portion of the tunnel.

Though the August larva was still somewhat early in development when I found it, its stem tunnel was already extensive. A photograph of a portion of the tunnel shows that its walls were smooth. A leaf attached to this stem contained a brownish mine that began at an oviposition site in the midrib and traveled down the petiole into the stem, but I hypothesized that this mine was the work of a mordellid larva that did not survive, rather than the work of the erotylid larva (see records {0021} & {0727}); at least in *Leucanthemum*, *Medicago*, and *Lupinus*, oviposition by the erotylid *Languria mozardi* appears to be mostly or entirely restricted to the main stem rather than in a leaf midrib or petiole (Vaurie 1948; Tangren & Frye 2020).

I reared multiple overwintering larvae to adulthood. These larvae pupated in their stem tunnels, and adults emerged in spring.
...
Tangren, S.A. and C.T. Frye. 2020. Clover stem borer infestation in sundial lupine: recognition and consequences. Natural Areas Journal 40(2):121–128.

Vaurie, P. 1948. A review of the North American Languriidae. Bulletin of the American Museum of Natural History 92(3): 119-156 + 2 figs.

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[0021 - Ageratina]
I have observed both whitish and yellowish mordellid larvae (all apparently belonging to this species) overwintering in their tunnels in dead stems of the host. Usually they were present in the lower portions of the stems near ground level, but in some shorter, less robust plants, I found them in the middle or even upper reaches of the stems. Their tunnels tended to be quite smooth-walled. In many cases a larva had packed an accumulation of very finely powdered whitish frass into the very base of the tunnel at or just above ground level.
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Also, in mid-August I observed a larva tunneling in the lower portion of a petiole. Its tunnel was externally detectable as a brownish discoloration to the petiole. I found at least two other leaves with similarly affected petioles; in one case the tunnel appeared to stop abruptly at the petiole's attachment point to the stem and no larva was present, while in the other example, the tunnel began in the leaf midrib and proceeded down the petiole into the stem. An erotylid larva dwelled in the interior of the stem in the latter example, but given that I'd determined a mordellid larva to be responsible for a similar petiole tunnel in another *A. altissima* plant, I hypothesized that the erotylid larva was not responsible for the midrib and petiole feeding in this example, and that it had perhaps displaced a mordellid larva that had been responsible.

From the overwintering larvae, I reared several adults. Both larvae and adults showed a surprisingly large degree of variability in body length, and larval body color varied considerably as well, but reared adults were all fairly similar in coloration. The identity of these individuals is unknown as of 2025. Ford & Jackman (1996) reared *Mordellistena rubrifascia* from this host.

See also record {0727}.
...
Ford, E.J. and J.A. Jackman. 1996. New larval host plant associations of tumbling flower beetles (Coleoptera: Mordellidae) in North America. The Coleopterists' Bulletin 50(4): 361-368.

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[0727 - Ageratina]
I collected a pupa in its tunnel in an overwintered dead stem of the host in late May. The adult, which eclosed by June 6, bore mottling on the elytra similar to that of *Mordellina pustulata* (Mordellistenini). Adults identified as *M. pustulata* have been previously reared from *Eupatorium perfoliatum*, *E. serotinum*, and *Eutrochium maculatum* (Lisberg & Young 2003; Ford & Jackman 1996; Williams 1999), all of which share the tribe Eupatorieae with *Ageratina* (Compositae Working Group 2025).

See also record {0021}.
...
Compositae Working Group (CWG). 2025. Global Compositae Database. Eupatorieae Cass.. Retrieved July 13, 2025 from [URL : https://www.compositae.org/gcd/aphia.php?p=taxdetails&id=1074859 : end URL].

Ford, E.J. and J.A. Jackman. 1996. New larval host plant associations of tumbling flower beetles (Coleoptera: Mordellidae) in North America. The Coleopterists' Bulletin 50(4): 361-368.

Lisberg, A.E. and D.K. Young. 2003. An annotated checklist of Wisconsin Mordellidae (Coleoptera). Insecta Mundi 17(3-4): 195-202.

Williams, A.H. 1999. Fauna overwintering in or on stems of Wisconsin prairie forbs. Proceedings of the North American Prairie Conference 16: 156-161.

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[0030, 0031 - Ageratina]
I first encountered an agromyzid borer in white snakeroot in 2023, in the form of a puparium overwintering in a tunnel in the pith of an upper stem belonging to a short-statured plant. The plant had grown only ~18 inches tall in the shade of eastern red cedar (*Juniperus virginiana*) trees, and its outer stem diameter was only 1.75mm at the puparium's location in the upper stem. The puparium was a mere 2.0mm in length. Its posterior spiracular plates were dark brown, slightly elevated, and separated by approximately their own diameter, with roughly 8-10 bulbs each.

Later, I found similar puparia, most about 2.2mm in length but one 3.1mm long, and with up to 14 bulbs on the posterior spiracular plates, in the pith of variously-sized lower stems of the host. Most of the upper and lower stem puparia each contained a solitary parasitoid wasp larva along with a large deposit of black material (meconium?) pooled on the inner wall of the posterior portion of the puparium. My attempts to rear puparia to adulthood have so far only produced parasitoid wasps.

Additionally, I found a larva tunneling in the pith in the base of a wilted stem in July. Just below this larva's area of activity, the stem contained a caterpillar of a cochyline tortricid, cf. *Aethes angustana* sp. grp. (record {0025}), whose work appeared to be the primary cause of the wilting. The agromyzid larva showed 8 and 11 bulbs in its posterior spiracles.

My initial looks at the posterior spiracles of the agromyzid larva and puparia weren't sufficient to provide much insight on how many agromyzid species might be represented in these observations. An adult female agromyzid identified as *Melanagromyza virens* has been previously reared from a puparium found overwintering in a stem of this host (Lonsdale 2021). Spencer and Steyskal (1986) describe and illustrate a "strong central horn" on each of the posterior spiracular plates of the *M. virens* puparium, while the larva and puparia I found in white snakeroot showed either very short, stublike horns or none at all.

Despite examining many agromyzid puparia from inside white snakeroot stems, I have yet to find a viable one. This mirrors the situation with the tephritid borer ({0029}), in which internally-formed puparia often seem to be parasitized. With the tephritid, the pupation location for healthy larvae is generally in the soil, according to Stoltzfus (1988), and it is possible this could be the case for the agromyzid as well, but more information is needed.
...
Lonsdale, O. 2021. Manual of North American Agromyzidae (Diptera, Schizophora), with revision of the fauna of the “Delmarva” states. ZooKeys 1051: 1–481. DOI: [URL : https://doi.org/10.3897/zookeys.1051.64603 : end URL].

Spencer, K.A., and G.C. Steyskal. 1986. Manual of the Agromyzidae (Díptera) of the United States. U.S. Dept. of Agriculture, Agriculture Handbook No. 638.

Stoltzfus, W.B. 1988. The taxonomy and biology of *Strauzia* (Diptera: Tephritidae). Jour. Iowa Acad. Sci. 95(4): 117-126.

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[0029 - Ageratina]
I observed several parasitized puparia of this borer in tunneled-out lower stems of the host, and reared an ichneumonoid wasp from one of these puparia in 2021. I also found a nearly mature larva in its tunnel in a lower stem of the host in the final days of August, 2024, and reared it to the puparium stage. I felt fairly confident these were all tephritids and specifically *Strauzia* sp., since (1) they were similar in all respects to third instar *Strauzia* larvae figured in Stoltzfus (1988) and (2) I haven't been able to find a record of any other fly of this size tunneling in white snakeroot stems. However, I wanted to to confirm this identification so I sought to run the puparia through a key. I was not able to find a Diptera puparium key for the Nearctic fauna, but the puparia did key to Tephritidae in Smith (1989).

Apparently the only tephritid borer previously recorded from *Ageratina altissima* is *Strauzia rugosum*, described from specimens collected in Ohio, Virginia and West Virginia by Stoltzfus (ibid.). Stoltzfus stated that larvae were found as late as October, with puparia formed no later than early November. The typical pupation location is evidently in the soil, and the puparia collected in the current study may have been formed in the stem because the individuals were parasitized.

On 1 November 2023, I found an affected stem whose top had broken off due to the tunneling in the stem interior. The borer's tunnel extended from roughly 15cm above the break point
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(in the upper portion of the stem), down to ground level in the lower portion of the stem, but did not appear to extend into the roots. The tunnel width, ragged tunnel walls, and the fact that the culprit abandoned the stem when mature (evidently in order to pupate off the plant) together suggested the tunneling was accomplished by a tephritid borer, but I was unable to confirm this identification because the larva was no longer present.

Some tunnels constructed by tephritids in this host (tentatively identified as such by the parasitized puparia found within them) contained particulate frass that had been cemented to the tunnel walls in aggregate, forming brittle hollow cylinders of agglomerated material. When removed from the tunnels and crushed, some of these cylinders crumbled easily into material reminiscent of solid frass produced by various Coleoptera and Lepidoptera larvae, while other cylinders merely fragmented into smaller chunks and did not easily crumble.

Strauzia rugosum is not to be confused with the *Eutreta* local feeder in stems of the same host (record {0024}).
...
Smith, K.G.V. 1989. An introduction to the immature stages of British flies. Handbooks for the identification of British insects, vol. 10, part 14.

Stoltzfus, W.B. 1988. The taxonomy and biology of *Strauzia* (Diptera: Tephritidae). Jour. Iowa Acad. Sci. 95(4): 117-126.

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[0027 - Ageratina]
In late May, I found a young shoot of the host containing a tunnel with an early- or middle-instar *Papaipema* larva inside. The shoot had wilted conspicuously as a result of the larva's tunneling. Because of the relatively small size of the shoot, the larva would presumably need to migrate to the roots or to another stem at some point in order to complete its development.
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[0025 - Ageratina]
A wilted stem of the host I located in early July contained a larva in its tunnel in the base of the stem and crown, with the larva's activities evidently having led to the plant wilting. An agromyzid larva (record {0030}) was tunneling in the pith of the same stem, only a few millimeters above the tunnel system of the caterpillar. In its tunnel, the tortricid larva spun a loose, whitish, rather "messy" cocoon that incorporated some of the larva's frass, and the adult moth emerged in August. An image taken by Alexander (2012) in mid-August in New Jersey, USA and posted to BugGuide.net shows a moth that appears externally similar to this one perched on a white snakeroot leaf; the image is filed under "*Aethes angustana* species group." Comments posted with the image explain that Alexander had witnessed a similar-looking moth perched on white snakeroot plants at this location in the years before the photo was taken, leading her to wonder if white snakeroot might be the host plant. My rearing record in the current study would seem to support this hypothesis, although the adult has not yet been examined by a specialist in order to confirm its identity.

In addition to the July larva that was reared to adulthood, I found several larvae (not reared to adulthood) overwintering in the bases of white snakeroot stems. Details of the head capsule suggested these larvae could possibly belong to the same species as the individual reared to adulthood, but unfortunately this could not be confirmed. If true, it suggests that the moth might have two generations per year, with the first generation overwintering as larvae in dead stems and giving rise to adults in spring, and the second generation feeding as larvae in midsummer and producing adults by sometime in August.
...
Alexander, Y. 2012. *Aethes angustana*. Contributor post at BugGuide.net. Retrieved February 22, 2024 from [URL : https://bugguide.net/node/view/690471/ : end URL].

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[0028 - Ageratina]
This borer's activities seem to usually occur in the middle to upper portions of white snakeroot stems; this may in part be a response to the fact that lower stems of the host are often occupied by mordellid, erotylid, or tephritid borers.

The larva of this moth feeds in the stem of the mature hostplant during late summer and autumn, excavating the pith completely in its relatively localized area of activity. As a result of the pith feeding, and sometimes also the external damage to the outer wall of the stem (discussed below), the stem is weakened at this point, and the topmost portion of the plant above the affected area may lodge conspicuously, signaling the presence of a larva inside. (In at least one example I observed, the stem did not lodge.) Because larval feeding frequently happens in the upper part of the stem, the lodged terminal portion of the plant may be only a decimeter or two in length.

Interiorly, frass accumulates in the larva's tunnel. The larva spends the winter and spring in the stem and pupates there in its second summer, sometimes within a thin membranous cocoon with the consistency of cellophane. When the adult is ready to emerge, the pupa is thrust partway out of the stem.

I reared adults in summer 2021 and 2023 from larvae collected in spring, after they had overwintered in the field. The individual successfully reared in 2021 was collected as a larva on 17 April but did not emerge as an adult until 30 June; the 2023 individual was collected as a larva on 07 June and emerged on 23 July. The late emergence time of the adult is perhaps not surprising given that the hostplant does not mature until late summer into autumn.

The forewing of the adult has a white ground color with patches of blue-gray and rusty orange scales. Similar-looking adults reared by Hatfield (2022) emerged in autumn only a few weeks after the larvae had finished feeding. As larvae, these individuals fed externally on flowers and/or developing seeds in the inflorescence, and Hatfield photographed one of them feeding on a flower gall formed by *Schizomyia eupatoriflorae* (Diptera: Cecidomyiidae). Because of the similar larval phenology and adult morphology, I suggest that the larvae feeding in flowers and stems belong to the same species -- which would be *Cochylichroa avita*, based on M. Sabourin's determination of the Hatfield material (ibid.).

It is possible some individuals may feed first in the inflorescence of the plant and then migrate into the stem. At the weak point where they lodge, some stems show an irregularly-shaped hole in the outer wall of the stem (continuous with the inner pith tunneling), which appears to have contributed to the weakening of the stem and its eventual lodging. This external hole could be the result of the larva tunneling into the stem from the outside after having fed externally on flowers or fruit, but it could also be cut from the inside by a larva that was in the pith all along; further study would be needed in order to resolve this question. The adults I reared from upper stems have not yet been examined by a specialist in order to clinch their identity.
...
Hatfield, MJ. 2022. Tortricidae, head in white snakeroot gall. Contributor post at BugGuide.net. Retrieved February 23, 2024 from [URL : https://bugguide.net/node/view/2189677 : end URL].

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[0026 - Ageratina]
I located multiple examples of this miner in late August through mid-October, after the larvae had vacated the plant material. One mine I found in mid-July was also apparently vacant. In some cases, the externally visible linear stem mine was bound between two adjacent nodes of the stem, and it wound up and down along the length of the internode, crisscrossing and overlapping itself so as to effectively create a blotch mine in which most of the internode assumed a brownish discoloration. Close examination of the mine revealed a narrow, broken central frass line appearing like a string of dots and dashes. In at least

two other examples, the mine wandered across multiple internodes, with only a portion of the surface tissue of each internode affected.

I have observed the distinctive pattern of brownish stem mining bound between two nodes on other plants, including leaf-cup (Asteraceae: *Polymnia canadensis*) and Culver's root (Plantaginaceae: *Veronicastrum virginicum*). An early-stage stem mine on the former host, which did not exhibit the pattern of being restricted between two nodes (perhaps because the mine was still in the beginning stages), contained a Lepidoptera larva that appeared to belong to the family Gracillariidae. In addition, one of the *Veronicastrum* mines contained a Lepidoptera head capsule that was superficially consistent with the family Gracillariidae. Given this fact along with certain characteristics of the white snakeroot mines, such as their very shallow penetration into the stem tissue and the occurence of a central frass line, I propose that the white snakeroot miner is also a gracillariid, but this has yet to be confirmed. Since I haven't observed any bark flaps or other signs of pupae in the white snakeroot mines, I believe pupation is off the plant or at least not within the mine.
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[0632 - Ageratina]
In September, I located a single polythalamous stem gall of this local feeder near the tip of an upper stem. The gall featured 2 exit holes and 8 individual chambers lined with whitish fungus, with the exit holes each opening from one of the chambers. At least 2 of the chambers -- apparently the same ones with exit holes leading to the outside world -- had insect exoskeleton remains in them, but most of the other chambers appeared to be empty, and these empty chambers also did not have obvious holes leading to the outside of the gall. Any insects that had successfully developed in the gall had already emerged, and this fact and all other characteristics of the gall closely match the description of *Asphondylia eupatorii* in Gagné (1989). Compare with the *Neolasioptera* galls on this host (record {0022}).
...
Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

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[0022 - Ageratina]
I found the gall midges included in this record in at least three situations in white snakeroot plants: (1) within leaf petioles that showed discoloration but essentially no swelling, (2) in lumpy, somewhat irregular, spindle-shaped to ovoid galls in upper stems, and (3) in ovoid to subglobular stem galls near the base of the stems, with some galls clustered in groups. Larvae from (1) have been confirmed as belonging to the genus *Neolasioptera* (see below), while larvae from (2) and larvae and adults from (3) are as yet unidentified beyond family level.

I located the first example of a petiole feeder in 2018, in the form of a pupal exuvium protruding from a discolored area on a petiole; inside the petiole was an apparent cecidomyiid cocoon in which the posterior end of the exuvium was still hidden, and next to the cocoon was the pupa of a wasp that had evidently parasitized a second cecidomyiid that had been present in the petiole. In October 2020, I found two petioles that each contained multiple yellowish or orangish *Neolasioptera* larvae in their interiors; in one of the petioles, larvae were located in a spot about halfway along the length of the petiole, with nothing but a slight crook in the petiole and some subtle outward discoloration to reveal their presence; in the other petiole, the larvae were clustered within the base of the petiole right where it joined the stem, and the leaf had prematurely wilted. R.J. Gagné (pers. comm., November 2, 2021) identified these larvae as *Neolasioptera* sp.

I encountered several examples of the slender, irregular upper stem galls in living and senesced stems. Two of these, in overwintering dead stems, were partially hollow inside and filled with black fungal material, but they contained no larvae so there remained some uncertainty as to the culprit. A third example I found on a living stem in late summer. I

overwintered the gall indoors and found that it contained multiple larvae in the pith (panel F below) accompanied by some black fungal discoloration. The larvae's general appearance and the gall characteristics were reminiscent of *Neolasioptera*, but the larvae have not yet been identified to genus or species.

The subglobular stem galls occur singly or in clusters near the base of the stem, within ~20cm of ground level. In one example I observed, the larva overwintered in the gall and the adult emerged in spring. In another example, the gall was closer to ovoid in shape, 11mm long by 5.5mm wide, and it contained at least 11 larvae who overwintered in the gall and emerged as adults in spring. These galls may alternatively produce eurytomid wasps (see record {0023}), who seem to conduct at least some of their feeding on gall tissue, perhaps after consuming the original cecidomyiid inhabitant.
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[0032 - Ageratina]
In July 2023, I discovered numerous orangish or pale pinkish larvae living gregariously in the somewhat airy pith of two lower stems of the host. There was a limited brownish discoloration to the pith in the area where the larvae dwelled, but no external sign of their presence in the stems was observed. The larvae were identified to genus by R.J. Gagné from photos (pers. comm., March 2, 2024).

Later, in late July 2025, I collected a white snakeroot stem in my yard that showed an externally blackened region. Over the next few weeks, *Resseliella* larvae emerged from this portion of the stem and pupated naked (i.e., without a cocoon) in the potting mix at the bottom of the rearing container or in between layers of moist paper toweling appressed to the side of the container. Several adults emerged in the final days of August and first days of September.
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[0024 - Ageratina]
Forms a gall in the upper stem. I observed two examples in August and a third in September, and found at least one additional, uninhabited example on a dead stem in winter. All of these galls had been established at a node on the upper stem, with the growth of the stem and leaves above the affected node becoming stunted. One of the August galls was ovoid, roughly 10-12mm long and ~8mm wide, and the other was about the same size but with a somewhat less pronounced swelling. The inner walls of the August galls were rough-textured with a dark brown color, and each gall contained a modest amount of granular frass accumulation and an intact tephritid puparium. The puparia were a yellowish-brown color overall with the anterior end darkened to nearly black. The gall observed in September had ruptured, perhaps in part as a result of the adult fly's recent emergence, resulting in the blackened gall interior becoming partially exposed, which revealed the spent puparium inside. Despite this large exposed wound, the leaves issuing from the node and the short length of stem above the node were still alive. The gall found on a dead stem in winter also displayed a large hole resulting from the adult's emergence in the previous summer, and the empty puparium was still inside the gall.

A puparium from one of the August galls produced an adult *Eutreta* on August 13. Similar galls on *Eutrochium*, *Polymnia*, and *Galinsoga* (all Asteraceae) that I found in the same local geographic area also produced adults belonging to the genus *Eutreta*.
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[0023 - Ageratina]
The feeding site of this insect is a subglobular stem gall on white snakeroot. Galls may occur singly or in clusters, and all examples noted have been on the lower stems within ~20cm of the ground. Insects I reared from these galls include a cecidomyiid (cf.
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Neolasioptera sp.) and these wasps, which belong to the family Eurytomidae as determined by Hill (2023) and Zuparko (2023). The ?*Neolasioptera* is probably the original gallmaker (see record {0022}). However, two galls that produced eurytomid wasps contained solid, rather large-grained frass, which is not typically produced by *Neolasioptera*s, and the frass had accumulated in a curving tunnel whose diameter seemed too large for a typical *Neolasioptera* tunnel.

Given these peculiarities, I hypothesize that the wasp may be both a phytophage and an entomophage -- i.e., one of the species of Eurytomidae that is known to feed first on an insect gallmaker and then on the plant tissue inside the gall in order to complete its development. This would explain the situation neatly -- the significantly larger size of the wasp, the accumulations of solid granular frass in the wasp-producing galls, the relatively broad tunnel width inside the wasp-producing galls, and the fact that some galls give rise to ?*Neolasioptera*s instead. It is also conceivable that, in galls that contain multiple cecidomyiid larvae, the eurytomid larva consumes them all in order to complete its development, accounting for its larger size; in this instance the frass would be a result of the wasp larva excavating the gall interior (but not necessarily consuming the excavated material) in order to reach the multiple cecidomyiid larvae.

For examples of publications citing previously known cases in which a eurytomid has been observed to feed first on an insect gallmaker and then on plant tissue, or to move through a gall and consume multiple gallmaker larvae, see Saghaei et al. (2018) and Noyes (2004).
...
Hill, R. 2023. Comment on contributor post at BugGuide.net. Retrieved November 12, 2023 from [URL : https://bugguide.net/node/view/2312449 : end URL].

Noyes, J.S. 2004. Notes on families: Eurytomidae. In Universal Chalcidoidea Database. World Wide Web electronic publication. Retrieved November 12, 2023 from [URL : https://www.nhm.ac.uk/our-science/data/chalcidoids/eurytomidae.html : end URL].

Saghaei, N., Fallahzadeh, M., and H. Lotfalizadeh. 2018. Annotated catalog of Eurytomidae (Hymenoptera: Chalcidoidea) from Iran. Trans. Amer. Ent. Soc. 144:263-293.

Zuparko, B. 2023. Comment on contributor post at BugGuide.net. Retrieved November 12, 2023 from [URL : https://bugguide.net/node/view/2312446 : end URL].

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Agrostis

[0650 - Agrostis]
I found a deceased larva in a senesced culm of the host in winter. Its labrum (a part of the head skeleton) was somewhat curved or hooked in shape.
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Alliaria

[0033 - Alliaria]
The main population of garlic mustard examined thus far in the current study supported a large amount of stem herbivory by at least one species of coleopteran borer evidently belonging to the Curculionoidea (based on the larva's general appearance). Larvae tunneled

in the stem interiors in spring and early summer, with evidence suggesting there may sometimes be multiple larvae per stem. The tunnels were not externally visible. Some tunnels contained accumulations of solid frass. Even somewhat heavily occupied plants developed seedheads with several pods each.

Blossey et al. (2001, 2002) reported that they observed "stem-mining weevils" (Curculionidae) in their field surveys of garlic mustard herbivores in North America, but they did not furnish a genus- or species-level identification for the weevils. They also did not specify if the weevils' feeding was externally visible in shallow tissues ("true" stem mining as understood in the current study) or out of sight in deeper tissues (stem boring). Blossey et al. (2001) go on to list two weevil species, *Ceutorhynchus alliariae* and *C. roberti*, whose larvae "mine stems and leaf petioles" of garlic mustard in Europe, along with other *Ceutorhynchus* species who are known to feed in petioles, root crowns, and seeds of this host in its native range. Gerber et al. (2008) refer to *C. alliariae* and *C. roberti* as stem borers. It is tempting to speculate that a *Ceutorhynchus* species, either introduced to North America or native and typically found on a native host, may be the borer observed in the current study, but further research would be needed to assess this hypothesis.
...
Blossey, B., Nuzzo, V., Hinz, H., and E. Gerber. 2001. Developing biological control of *Alliaria petiolata* (M. Bieb.) Cavara and Grande (garlic mustard). Natural Areas Journal 21(4): 357–367.

Blossey, B., Nuzzo, V., Hinz, H., and E. Gerber. 2002. Garlic mustard. Chapter 29 in Van Driesche, R., et al., 2002. Biological control of invasive plants in the eastern United States. USDA Forest Service Publication FHTET-2002-04. 413 pp.

Gerber, E., Hinz, H.L., and B. Blossey. 2008. Pre-release impact assessment of two stem-boring weevils proposed as biological control agents for *Alliaria petiolata*. Biological Control 45(3): 360-367.

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[0036 - Alliaria]
In December 2022 I found a young larva overwintering in a tunnel in the pith of a stem. The larva was a pale whitish color, with dorsal ampullae and diminutive paired urogomphi that were triangular in lateral view. I did not rear it to adulthood.

Later, in December 2024 I found similar mordellid larvae overwintering in garlic mustard dead stems in my yard. I reared one of these to adulthood in early 2025. The adult was a very small mordellid, brick-red overall with some darker shades of reddish-black on the outer edges of the elytra and the underside of the second thoracic segment. It left a roundish exit hole in the stem when it emerged.
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[0034 - Alliaria]
On 23 June 2022 I collected a mature garlic mustard plant with a short, whitish, linear stem mine in the upper half of the stem. I examined the mine closely and found it to contain a very young gracillariid larva (see record {0035}), but I observed no other larvae. I held the stem in a rearing container until 20 July, when a female *Ophiomyia* sp. agromyzid emerged. Examination of the stem revealed the fly's puparium formed just under the epidermis, surrounded by extensive stem mining with a pattern of alternating strips of frass. The gracillariid larva was nowhere to be found and the whitish linear mine containing it had long since been obliterated by the fly's mining. Blossey et al. (2001) mention a stem-mining fly they found associated with garlic mustard in North America, but the fly's taxonomic family was not reported and the authors' definition of stem mining was not specified, so it is unclear whether the insect they found might be the same as this one.
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Blossey, B., Nuzzo, V., Hinz, H., and E. Gerber. 2001. Developing biological control of *Alliaria petiolata* (M. Bieb.) Cavara and Grande (garlic mustard). Natural Areas Journal 21(4): 357–367.

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[0035 - Alliaria]
I photographed a very young larva tentatively identified as *Marmara* sp. in a short, whitish, linear stem mine in late June. The larva's mine was later destroyed by an *Ophiomyia* sp. agromyzid larva mining the same stem (record {0034}), and the gracillariid larva evidently did not survive the competition with the fly.
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Amaranthus

[0625 - Amaranthus]
I examined an open-grown, highly-branched plant in late August, and found that the stems of two of the side branches each contained a single larva of this borer feeding in its tunnel in the stem interior. I taped the stems back together and held them in a rearing container. Three days later, I observed one of the larvae alive and actively moving at the bottom of the rearing container. When placed briefly on a table surface and held in the palm of a hand, the larva made repeated jumps by hooking its mouthhooks onto the rear part of its body, flexing a bit, then springing away, similar to what I have observed some cecidomyiids doing after evacuating their galls in other hosts. I placed the vaulting larva in a vial of moistened potting mix, and it immediately began burrowing into the substrate, appearing to lead with its posterior end.

In early September I searched the potting mix and found the fly's puparium. Also in early September, I discovered that the second larva had pupated while still inside its tunnel in the stem of its side branch. Both puparia possessed a distinctly wide, hemispherical or dome-shaped anterior end, with the posterior end more slender and tapered but also somewhat rounded. Photos of one of the larvae show what appears to be a set of just 3 bulblike openings on each posterior spiracle, the three openings arranged at 75- to 90-degree angles to one another in the outer half of the circular spiracular area.

In late October, I examined an additional side branch stem from the same plant and found a tunnel in the stem interior, similar in all respects to the tunnels of the first two larvae and leading to a round exit hole in the outer wall of the stem. The tunnel walls were of a brown color, lumpy and irregular with some ragged material left over from feeding. When viewed from the stem exterior, the exit hole was surrounded by an oval ring of light brown necrotic tissue that contrasted with the pale green color of the adjoining healthy tissue, making the exit hole stand out.

Adults did not emerge from the puparia by the end of the growing season, so the puparium is evidently the overwintering stage.

The agromyzid *Amauromyza abnormalis* has been previously recorded as a stem borer in *Amaranthus* (Spencer and Steyskal 1986).
...
Spencer, K.A., and G.C. Steyskal. 1986. Manual of the Agromyzidae (Díptera) of the United States. U.S. Dept. of Agriculture, Agriculture Handbook No. 638.

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Ambrosia

[0660 - Ambrosia]
In late September, I found a larva in an interior tunnel in the middle to upper stem of the host. The tunnel appeared to have been primarily constructed by a tephritid larva that was dwelling lower in the same stem, and it was unclear to what extent the beetle larva had contributed visibly to the excavations. The larva was legless, with a pale yellowish-white body and a slightly darker head capsule bearing sclerotized, triangular mandibles and two small dark eyes positioned just behind the bases of the mandibles. In some respects the larva appeared very similar to brentid larvae encountered in other hostplants in the current survey, and a brentid has been previously reared from stems of giant ragweed in the geographic area covered by this survey (Hatfield 2021). Interestingly, in the image from the Hatfield reference, the adult weevil is shown in a tunnel that appears to be mostly the work of a larger borer, similar to the situation in which the larva in the current record was found. Further study would be required to better understand the ecological role of these beetles in the internal stem ecosystem.
...
Hatfield, M.J. 2021. Brentidae, in giant ragweed stem - *Fallapion*. Contributor post on BugGuide.net. Retrieved March 3, 2024 from [URL : https://bugguide.net/node/view/2027808 : end URL].

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[0636 - Ambrosia]
I discovered a larva in its tunnel in the main stem of the host in mid-October. A 15-cm section of the lower stem tunneled by the larva had been so completely cleared of internal tissue, and compacted frass piled up so densely in a tunnel just above this point, that the hollowed portion transmitted significantly more light when backlit by the slanting autumn sun than the portion with the frass just above it. Thanks in no small part to the brightness and low angle of the sun, this was a rare case in which a stem borer's excavations of internal tissue in a lower stem were externally visible. When I dissected the stem, I noticed that the walls of the larva's tunnel possessed a slightly rough but not ragged texture. The active larva was a bright orange color, and it overwintered in the stem. Near where I observed this larva, Hatfield (2019) reared *Acropteroxys gracilis* from stems of the same host, and this seems like my larva's most likely identity.
...
Hatfield, M.J. 2019. Erotylidae, slender lizard beetle, dorsal - *Acropteroxys gracilis*. Contributor post on BugGuide.net. Retrieved March 3, 2024 from [URL : https://bugguide.net/node/view/1629192 : end URL].

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[0045 - Ambrosia]
In 2022, I examined the stem of a side branch of the host and found it to contain a larva of this borer in the pith, along with an agromyzid puparium (record {0040}) and approximately 12-15 larvae of a cecidomyiid (record {0667}). The mordellid larva was a dull yellow color, with dorsal ampullae and a pair of minute urogomphi that were triangular in lateral view. The adult emerged through a small oval exit hole in the stem in spring. It was a grayish-black color with a uniform, silvery-golden pubescence covering most of the elytra. A note from my 2016 records that mentions a "beetle larva...inside the base of a side [branch], right where it connected to the main stem" is also tentatively placed here.
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[0040 - Ambrosia]
I observed a puparium approximately 12 cm above ground level in a tunnel in the interior of a short-statured, small-diameter stem of giant ragweed (stem thickness ~8mm at base) that
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had grown along a trail in an upland woods, not far from the woodland edge and a crop field. The tunnel was typical for Agromyzidae, narrow with ragged walls and no significant solid frass accumulation. The posterior spiracular discs of the puparium were black in color and separated by approximately 1.5 times their diameter, and they possessed horns that were distinctly curved. I successfully overwintered the puparium, and an adult emerged the following spring. Additionally, I reared an adult from the stem of a side branch of giant ragweed collected in winter. The same side branch stem also contained a mordellid larva (record {0045}) and approximately 12-15 cecidomyiid larvae (record {0667}). The posterior spiracular discs of the puparium from the side branch were also black in color, but they were separated by a distance approximately equal to their diameter, and the spiracular horns appeared to be straight rather than curved.
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[0037, 0039 - Ambrosia]
I found a larva tunneling in the interior of a lower stem of giant ragweed in late September. I did not rear it to adulthood, but the morphology of its anterior and posterior spiracles and the anterior portion of the cephaloskeleton, along with the overall lateral habitus, matched the images of *Strauzia perfecta* shown in Stoltzfus (1988), and the habitus also matched the images of *S. perfecta* reared by Hatfield (2023) from the same host and geographic area.

The anterior spiracles of this borer, as present in the aforementioned larva and as shown in Stoltzfus, possess many individual papillae arranged in a spreading fanlike configuration, with the dorsal portion of the fan being about double the length of the ventral portion. Posterior spiracles show 3 slits each, all three of them more or less straight, two of them positioned roughly parallel to one another and separated by a distance approximately equal to their length, the third slit close to touching the middle slit and angled away from it about 30-45 degrees. Spiracles of other *Strauzia* spp. may be similar, but *S. perfecta* is the only *Strauzia* previously recorded from giant ragweed according to Stoltzfus (ibid.).

I also dissected dead stems of giant ragweed in the winter and found them to contain extensive internal tunnel systems with little or no solid frass accumulation and with the culprits absent. The extent of the interior damage to the large, thick stalks of the hostplant, compared to the relatively narrow diameter of the tunnels, clearly indicated that the tunneling was accomplished by several larvae in a single stem. These characteristics match what is reported for *S. perfecta* by Stoltzfus (ibid.), who writes, "stems [of giant ragweed] two centimeters or larger [in diameter] may have 30 larvae infesting them, completely tunneling the pith and parenchyma tissues of the lower stem" (p. 125).

Additionally, I found a dead larva, tentatively identified as Tephritidae based in part on the features of the posterior spiracles, in its tunnel in a stem of common ragweed (*A. artemisiifolia*). The tunnel walls were ragged in the classic fashion of dipteran borers, and the tunnel extended through virtually the entire length of the stem, from near ground level up to nearly the very tip of the ~50 cm tall plant.
...
Hatfield, M.J. 2023. Diptera, 2nd stem of giant ragweed. Contributor post on BugGuide.net. Retrieved March 3, 2024 from [URL : https://bugguide.net/node/view/2214600 : end URL].

Stoltzfus, W.B. 1988. The taxonomy and biology of *Strauzia* (Diptera: Tephritidae). Jour. Iowa Acad. Sci. 95(4): 117-126.

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[0043 - Ambrosia]
I discovered a larva boring in a stem of the host in late July. I reared it on its original stem for about two weeks, then transferred it to a carrot. The adult emerged in mid-September.

In addition, I located affected stems in winter, after the stems had senesced and the culprit was long since absent. These stems each contained a large (~50mm long) spindle-shaped swelling near the base. Inside each swelling was a central cavity with some compacted frass on the upper and/or lower end, along with a large round exit hole opening to the stem exterior. One of the swellings contained a spent pupa in the central cavity with its anterior end facing the hole. The head capsule of the final instar larva was also present in the cavity along with the pupal exuviae. All the examined material appeared in close agreement with photos of *Papaipema* life stages identified as *P. nebris* in VanDyk (2024c) and Moth Photographers Group (2024), but I was unable to rule out the presence of more than one *Papaipema* species in my observations.
...
Moth Photographers Group. 2024. *Papaipema nebris* (Guenée, 1852). Retrieved July 9, 2024 from [URL : https://mothphotographersgroup.msstate.edu/species.php?hodges=9496 : end URL].

VanDyk, J., ed. 2024c. Species *Papaipema nebris* - Stalk Borer - Hodges#9496. Species page at BugGuide.net. Retrieved July 9, 2024 from [URL : https://bugguide.net/node/view/5404/bgimage : end URL].

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[0038 - Ambrosia]
I located a larva in its tunnel in the interior of an upper stem of common ragweed near the stem tip. There was no obvious swelling to the affected stem. The tunnel spanned most of the stem diameter and filled the upper 80-90mm of stem, with the lower 70mm of stem unaffected.

The larva dwelled at the upper end of the tunnel with a ~20mm-long rod of compacted solid frass immediately below it. The larva was a sunny yellow color with an orange-brown head capsule. It pupated in the stem, and the pupa was thrust through the outer wall of the stem when the adult emerged.

The adult has not been examined by an authority, but its plumage is closely similar to specimens identified as *E. strenuana* and *E. minutana* at BugGuide.net (VanDyk 2024a&b). Both of those species are known from stems of ragweed, and there is some indication they may have noticeably different feeding habits (Stegmaier 1971, Gilligan et al. 2020), but the larva from the current study seemed to exhibit a mix of the feeding habit characteristics that are purportedly useful for separating the two species.
...
Gilligan, T., Wright, D., Brown, R., Augustinus, B.A., and U. Schaffner. 2020. Taxonomic issues related to biological control prospects for the ragweed borer, *Epiblema strenuana* (Lepidoptera: Tortricidae). Zootaxa 4729:347-358.

Stegmaier, C.E. 1971. Lepidoptera, Diptera, and Hymenoptera associated with *Ambrosia artemisiifolia* (Compositae) in Florida. Florida Entomologist 54:259–272.

VanDyk, J., ed. 2024a. Species *Epiblema minutana* - minute ragweed borer - Hodges#3172. Species page at BugGuide.net. Retrieved March 3, 2024 from [URL : https://bugguide.net/node/view/1881351/bgimage : end URL].

VanDyk, J., ed. 2024b. Species *Epiblema strenuana* - ragweed borer - Hodges#3172. Species page at BugGuide.net. Retrieved March 3, 2024 from [URL : https://bugguide.net/node/view/242550/bgimage : end URL].

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[0041 - Ambrosia]
This species forms a subtle swelling in the central stalk (rachis) of the spikelike raceme bearing the male flowers of giant ragweed. The swelling is approximately 1 cm long, irregular or spindle-shaped to ovoid, and noticeably darkened relative to the light greenish color of the unaffected rachis tissue above and below it. The flowers may need to be removed from the rachis in order to view the swelling more clearly, but even when not removed, they

may appear more densely packed at the location of the swelling, betraying the swelling's presence from afar.

I first located examples on 28 August 2016, by which time the culprit had already vacated the plant material. Taking samples a bit earlier in the month, on 15 August of the next year, yielded at least one example in which the larva was still present inside its swelling. Likewise, in 2018, two swellings collected on 17 August each still contained a larva inside, and by 21 August the larvae were crawling around in the rearing container, having evacuated the plant material.

Larvae were coleopteran, less than 10mm long at maturity, pale yellow in color with an orange-brown head capsule, the head capsule relatively large and dome-shaped, the abdomen tapering to the posterior, and the thorax bearing six short knobby bumps on its underside where legs would be expected. The overall impression was that of a somewhat slender weevil larva.

Larvae burrowed into the moistened potting mix provided to them, suggesting the typical pupation location is in the soil, and no adults emerged by the end of the growing season, suggesting that the larva or pupa overwinters. I have not yet managed to rear adults.

In Iowa, MJ Hatfield has reared a brentid weevil tentatively identified as *Fallapion* sp. from the lower parts of main stems of giant ragweed (Hatfield 2021), and has also collected a *Smicronyx* sp. in abundance on ragweed in early August (Hatfield 2013), but it is not clear whether the maker of the swellings in the flower cluster stalks might be related to either of these.
...
Hatfield, M.J. 2013. Curculionidae, dorsal - *Smicronyx*. Contributor post on BugGuide.net. Retrieved March 3, 2024 from [URL : https://bugguide.net/node/view/872390 : end URL].

Hatfield, M.J. 2021. Brentidae, in giant ragweed stem - *Fallapion*. Contributor post on BugGuide.net. Retrieved March 3, 2024 from [URL : https://bugguide.net/node/view/2027808 : end URL].

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[0667 - Ambrosia]
I discovered about 12-15 of these larvae living gregariously in the stem interior of a side branch of the host. They were a pale pinkish-orange color. The same side branch stem was also inhabited by an agromyzid puparium (record {0040}) and a mordellid larva (record {0045}). The cecidomyiid larvae possessed a pair of superficially hooklike structures on the posterior end that appeared to match the "recurved lobes on the terminal segment" described for the genus *Resseliella* on p. 56 and illustrated on p. 77 of Gagné (1989). I did not rear adults.
...
Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

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[0042 - Ambrosia]
Spindle-shaped to ovoid stem galls belonging to this tephritid graced plants growing in a brushy area I explored in late July. The galls occurred in the middle to upper part of the plant, with at least one example formed near the base of the stem of a side branch. Inside a typical gall were one to two central cavities, each with smooth inner walls that were the same color as the surrounding pith; the cavity interiors were clean and contained no solid frass. In one case, there were two cavities in a single gall, and the cavities were separated by a wall of pith. The larva observed inside one cavity was a plump maggot, fat and rounded at the posterior end and tapered at the anterior end, with a smooth white integument decorated with a series of striking black transverse markings on the abdominal segments. By early- to mid-August, larvae had formed black puparia in the galls. Puparia overwintered and adults emerged at the beginning of June the following year.

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Amorpha

[0046, 0706 - Amorpha]
This gall midge establishes a slight spindle-shaped swelling on the rachis (central stalk) of the compound leaf of the host. Parts of the swelling may assume a light brown discoloration. The individual leaflet attached to the swelling may wilt, or even the entire portion of leaf distal to the swelling. The larva lives in a smooth-walled chamber in the swelling, and the interior walls of the swelling may show some dark brown or black discoloration.

By mid-August, when I first observed this insect, many swellings displayed exit holes, having been recently evacuated by the mature larvae, but a few still contained bright orange larvae (one larva per swelling). In late May the following year, I noted exit holes in the bark of healthy twigs of the same plant. Buds of the host often occur in superposed pairs on the twig (van der Linden & Farrar 2016), and in two of the twig exit hole examples photographed, the exit hole was located in the slight woody protrusion supporting the larger, upper bud of the pair. Dissection of the twig at such points revealed a small, ~8mm-long ovoid chamber under the bark, the walls of the chamber smooth and blackened. I hypothesized that the twig and rachis modifications were both caused by the same cecidomyiid, and that as with the rachis swellings, larvae had exited the twigs the previous summer, and their exit holes had simply gone unnoticed over the winter.

These findings are from indigo bush (*A. fruticosa*), but an unidentified orange cecidomyiid larva has also been found in a slight bump on a twig of leadplant (*A. canescens*) in Iowa (Hatfield 2020), at the same time when larvae are active in indigo bush rachises. R.J. Gagné (pers. comm.) identified the indigo bush larvae to tribe.
...
Hatfield, M.J. 2020. Larva, lead plant stem. Contributor post at BugGuide.net. Retrieved March 6, 2024 from [URL : https://bugguide.net/node/view/1790467 : end URL].

van der Linden, P.J. and D.R. Farrar. 2016. Shrubs and vines of Iowa. University of Iowa Press: Iowa City.

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[0047, 0705 - Amorpha]
- Forms hard, spindle-shaped swellings on twigs
- The examples I photographed in 2016 and 2018 were about 25-35 mm in length, located on the upper portions of the twigs, within ~12 cm of the twig tips
- The galls are particularly conspicuous in winter, after leaves have fallen
- More information: Eiseman et al. (2024)
...
Eiseman, C.S., Nanz, S., O'Connor, M., and R.H. Biagi. 2024. Species *Walshia amorphella* - Hodges#1616. Species page at BugGuide.net. Retrieved March 6, 2024 from [URL : https://bugguide.net/node/view/586175 : end URL].

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Amphicarpaea

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[0048 - Amphicarpaea]
I found a puparium and a larva of this fly in 2021 and 2022, respectively, each in a tunnel in a lower stem of the host. In the 2021 example, the plant had wilted due to the tunneling in the stem.

The larva's body was yellowish-brown and somewhat translucent, with the tracheae and other internal structures partially visible through the integument. In the front was a pair of curved mouthhooks aligned exactly side-by-side. The paired anterior spiracles of the larva each consisted of a central stalk, thickened at the base and tapering toward the apex, bearing a number of distally projecting papillae or tubules, the whole structure at least vaguely reminiscent of a Christmas tree. The posterior spiracles were knob-shaped and reddish-brown in color, much darker than the relatively pale ground color of the larva's body.

The puparium from 2021 was cylindrical, rather elongate (roughly 4.5 times as long as wide), with a modified anterior end that was flattened into a slighly concave disc, the anterior spiracles projecting at approximately a right angle to the plane of the disc. Within the containing stem, this blunted anterior end of the puparium sealed off access to the insect's tunnel (and thus to the rest of the insect's body) neatly and cryptically, a behavior termed "phragmosis" that is also exhibited by many other burrow-forming animals (Rice 1969; Wheeler 1927; Wheeler & Hölldobler 1985). An adult emerged from the puparium the following spring, and B. Sinclair (pers. comm.) identified it.

The weight of evidence points to *S. vittata* as the stem borer that created the tunnels, and not as a secondary inhabitant of the stems; for further discussion of this evidence, see Eiseman & van der Linden (2024). To my knowledge, no *Stegana* species in North America has been previously recorded as a stem borer in an herbaceous plant (but see Laštovka & Máca (1982), O'Grady (2002), and Plakidas (2023) for examples of other worldwide collecting and rearing records).

Anatomical terminology for spiracles in this report is based on the description of *Drosophila melanogaster* in Wipfler et al. (2013).
...
Eiseman, C.S. and J. van der Linden. 2024. New rearing records of Drosophilidae (Diptera: Ephydroidea) from plant tissue. Proceedings of the Entomological Society of Washington 126(2): 172-182.

Laštovka, P. and J. Máca. 1982. European and North American species of the genus *Stegana* (Diptera, Drosophilidae). Annotationes Zoologicae et Botanicae (Slovenské Norodné Múzeum) 149:1-38.

O'Grady, P.M. 2002. New records for introduced Drosophilidae (Diptera) in Hawai‘i. In Records of the Hawaii Biological Survey for 2000—Part 2: Notes. Bishop Museum Occasional Papers 69:34-35.

Plakidas, J. 2023. *Stegana antigua* Wheeler 1960. Diptera: Drosophilidae - *Stegana antigua*. Contributor post on BugGuide.net. Retrieved July 9, 2024 from [URL : https://bugguide.net/node/view/2322536 : end URL].

Rice, M.E. 1969. Possible boring structures of sipunculids. Am. Zoologist 9: 803-812.

Wheeler, D.E. and B. Hölldobler. 1985. Cryptic phragmosis: the structural modifications. Psyche 92 (4): 337–353.

Wheeler, W.M. 1927. Physiognomy of insects. Q. Rev. Biol. 2: 1-36.

Wipfler, B., Schneeberg, K., Löffler, A., Hünefeld, F., Meier, R., and R.G. Beutel. 2013. The skeletomuscular system of the larva of *Drosophila melanogaster* (Drosophilidae, Diptera) – a contribution to the morphology of a model organism. Arthropod Structure & Development 42(1): 47-68.

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Andropogon

[0049 - Andropogon]
I found a larva boring in the very base of an overwintered dead culm of the host in a "postage stamp" remnant prairie in early May. According to my records, the larva pupated on 14 May and the adult emerged on 28 May, but no further details were recorded. The overall impression from the situation was that the larva had been present in the culm over the winter, having begun tunneling in it when the plant was still alive in the previous growing season, but this interpretation was not confirmed, so the record of this species as a herbivore (rather than a detritivore) is tentative. Mathison (2017) identified the adult from photos.
...
Mathison, B. 2017. Comment on contributor post at BugGuide.net. Retrieved March 9, 2024 from [URL : https://bugguide.net/node/view/1377108 : end URL].

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[0053 - Andropogon]
This borer tunnels in the culm of the host, at least sometimes starting fairly high in the culm (approximately 1m above the ground in one example I examined). A photograph of a larva's tunnel in a dissected stem at a point several decimeters above ground level shows that the tunnel was approximately 1/8 of the culm diameter, with rough-textured walls and no significant solid frass accumulation.

The late-stage larva is a warm yellow color, elongate (roughly 12 times as long as wide) and cylindrical, the body tapering little except at the very front, the posterior end rounded. On its anterior end, the larva possesses a pair of ventrally-pointing toothed mandibles and, dorsad of these, an unpaired sclerotized plate whose exposed portion appears triangular in lateral view. (See Johannsen & Crosby (1913) for a drawing of similar features in a species of *Thrypticus* from another host.)

The larva finishes up its feeding at the base of the plant where it passes the winter and constructs a pupation chamber in the senescent culm. In one instance I observed, the chamber was several centimeters long and it occupied most of the diameter of the culm. Upon the emergence of the adult fly from this stem, the pupa was thrust partway out of the culm. Examination of the pupal exuviae revealed transverse rows of posteriorly-directed spines on the abdominal segments, which had perhaps helped the pupa gain purchase on the inner walls of the chamber.

Two adults reared in 2017 have not yet been identified beyond the genus level.
...
Johannsen, O.A. and C.R. Crosby. 1913. The life history of *Thrypticus muhlenbergiae* sp. nov. (Diptera). Psyche: A Journal of Entomology 20:164-166.

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[0054 - Andropogon]
I observed larvae tunneling in shoots whose tips had died and turned brown. Several similarly damaged shoots from the same collection location contained cecidomyiid larvae (record {0051}) and/or puparia of a chloropid fly (record {0052}) instead of caterpillars. When held in a glass jar with 10cm-long cut sections of culm, the Lepidoptera larvae tunneled into these, feeding voraciously and generating copious quantities of frass in the culm interiors. Larvae were a pale tan color with a brown head capsule.
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[0051 - Andropogon]
In late July in a remnant prairie, I came upon shoots of big bluestem with dead, browned tips, and dissecting one of these revealed a Lepidoptera larva (record {0054}) feeding concealed within the shoot. I collected several similarly affected shoots for rearing. In mid-August I removed the shoots from the rearing container and dissected them; some contained these cecidomyiid larvae and/or puparia of chloropid flies (record {0052}) rather than caterpillars. The cecidomyiid larvae possessed a pair of lobes on the terminal segment that somewhat resemble those on the undetermined larva from figs. 89-90 in Gagné (1989), which was collected from seeds of the same host.

The plant material was decaying at this point, so it was not possible to tell with certainty, but it appeared the cecidomyiid larvae were sandwiched between the culm and its enveloping curled leaves, rather than actually inside the culm. The external appearance of the plant at the precise location where the larvae dwelled was not recorded; nor was it clear if the larvae were primary or secondary invaders of the plant tissue or what they were feeding on. Given the uncertainties, this record is listed tentatively.
...
Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

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[0052 - Andropogon]
I found puparia in shoots with killed tips, which I had originally collected because I determined while in the field that one contained a Lepidoptera larva tunneling inside (record {0054}). Some shoots also contained cecidomyiid larvae (record {0051}). Puparia of the chloropid were present by mid-August, with adults emerging in late August. I did not observe or record details about this insect's feeding behavior, and chloropids as a family exhibit a diverse array of feeding strategies including phytophagy but also saprophagy (Sabrosky 1987), so this record is listed tentatively.
...
Sabrosky, C.W. 1987. Chloropidae. Chapter 99, pp. 1049-1067 in McAlpine, J.F., Peterson, B.V., Shewell, G.E., Teskey, H.J., Vockeroth, J.R., and D.M. Wood. (Eds.). 1987. Manual of Nearctic Diptera, Volume 2 (No. 28). Research Branch Agriculture Canada.

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Anemone

[0057 - Anemone]
I first noted this species feeding in the stems of a species of thimbleweed (either *Anemone cylindrica* or *A. virginiana*) growing on a steep bluff prairie remnant.

At that location, a typical larva began its feeding by tunneling in the elongate receptacle forming the core of the thimble-like seedhead. The receptacle would at least sometimes be almost entirely hollowed out and filled with frass before the larva would exit the receptacle and tunnel into the stalk of the seedhead (the peduncle). The larva's act of hollowing out the receptacle and then migrating into the peduncle sometimes weakened the juncture between peduncle and receptacle, so that the seedheads of affected plants could be broken off easily if grasped between a person's thumb and forefinger and twisted gently.

Tunneling down through the peduncle, a typical larva from the bluff prairie site would then eventually arrive in the main stem of the plant. Further feeding occurred here, and the
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larva continued descending through the main stem until finally reaching the base of the plant, where it spent the fall and winter.

During autumn, in various locations in my study area, I have observed that mordellid larvae that have mostly completed their feeding in stems of thimbleweed may cut the main stem of the plant from the inside at a point roughly 10-20cm above ground level, causing the upper part of the plant to break off and leaving behind a lower stem "stump" with the larva inside. Such stumps have hollow interiors as a result of larval tunneling, but the open end created when the upper stem breaks off is sealed with a cap of frass, allowing the larva to pass the winter safely in the stump. I have noticed these mordellid-created stem stumps in thimbleweed plants growing both in open prairie remnants and in well-wooded habitats, but the woodland-dwelling plants had not had their seedhead receptacles hollowed out.

An individual I collected as a larva in late April 2018 pupated shortly thereafter but failed to emerge as an adult. Later, in spring 2024, I reared adults from overwintered larvae. The silvery-gold markings on the elytra of the adult beetle appear consistent with *Mordellistena incommunis*, when compared to images and a comment at BugGuide.net (see Eiseman 2011 and Moyer 2012). Upon emergence from the stem, one of the reared adults left a roundish exit hole in the stem stump just below the top end of the stump.

Plant anatomy terms used in this account were derived from Tenaglia and Missouri Native Plant Society (2023).
...
Eiseman, C.S. 2011. Mordellid. Contributor post on BugGuide.net. Retrieved December 3, 2024 from [URL : https://bugguide.net/node/view/598354 : end URL].

Moyer, T. 2012. Comment on contributor post at BugGuide.net. Retrieved December 3, 2024 from [URL : https://bugguide.net/node/view/598354 : end URL].

Tenaglia, D. and Missouri Native Plant Society. 2023. *Anemone virginiana* L., thimbleweed. In Missouri Plants [website]. Retrieved November 8, 2023 from [URL : https://www.missouriplants.com/Anemone_virginiana_page.html : end URL].

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[0058 - Anemone]
I have generally found plants inhabited by this agromyzid in relatively open upland woods. Larvae tunnel in the whitish tissue lining the stem interior of the thimbleweed host. From what I have observed, they feed in early to mid-June, before the hostplant has reached maturity. Early in their tunneling activities, some larvae girdle the shoot near its apex by tunneling shallowly around its circumference in a spiral pattern. Leaves above this girdled area may wilt or shrivel, providing a straightforward way for interested humans to locate inhabited stems in the field. After this initial work, larvae proceed into deeper tissues of the stem, and finish feeding at the base of the stem.

The one larva I examined closely and photographed was elongate, cylindrical, and pale yellowish-white in color. Its posterior spiracles were black in color and borne on short pale lobes projecting rearward from the posterior end of the terminal segment. The upper arm of the rearmost portion of the larva's cephalopharyngeal skeleton did not appear as if divided in two, suggesting this agromyzid belongs to subfamily Phytomyzinae (see Ellis 2024).

I reared two larvae to the puparium stage in 2021, with the puparia formed by late June. One of these puparia was formed inside its stem, while I found the other in the moistened tissue paper wrapped around the base of a stem in the rearing container. The puparia were black, widest near the anterior end and tapering to the posterior, the sides scalloped rather than smooth in profile, with the stalk of each anterior spiracle divided into two slightly curving arms (a rather unusual configuration among the stem-boring agromyzids I am familiar with).
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No adults emerged by the end of the growing season, suggesting that the puparium is the overwintering stage.
...
Ellis, W.N. 2024. Agromyzidae. In Plant Parasites of Europe [website]. Retrieved June 19, 2024 from [URL : https://bladmineerders.nl/parasites/animalia/arthropoda/insecta/diptera/brachycera/agromyzidae/ : end URL].

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[0055 - Anemone]
This mysterious insect begins feeding in the leaf blade of hepatica, where it creates a short, linear, dark brown mine that soon enters the petiole. The mine then proceeds straight down the petiole and disappears into the belowground parts of the plant, where the larva presumably does most of its feeding.

Some petioles from affected plants -- including the larva's first petiole, in which it traveled from leaf blade down to the crown of the plant, as well as other petioles from the same plant -- may also contain short, dark brown or blackish tunnels in their proximal ends, at the location where they emerge from the plant crown. These tunnels are much broader and more voluminous than the relatively narrow leaf blade and petiole-length mines, suggesting they are made by the older, larger larva, who must conduct brief excursions into the petiole bases during its time in the belowground parts of the plant.

I have observed leaf blade and petiole mines in mid-October, but by this time the leaves have already been abandoned by the larvae. I do not know exactly when larvae are active during the growing season, nor where or in what stage the insect overwinters.

I tentatively identify the insect as an agromyzid based on (1) the presence, in multiple examples examined, of host-feeding punctures in the leaf blade surrounding the start of the mine; (2) the ragged walls and absence of significant solid frass accumulation in the tunnels in the petiole bases; and (3) the width of the tunnels in the petiole bases, which is consistent with the size of an older agromyzid larva. This identification should be understood as tentative.

One avenue for future work on this insect could involve determining when the leaf blade and petiole mines are still inhabited and collecting them at this time, which would allow examination of actual larvae in order to better elucidate the insect's identity.
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[0056, 0059 - Anemone]
In autumn 2021, I discovered several larvae of this local feeder in the interiors of basal leaf petioles of hepatica and thimbleweed. At this time the larvae had finished their feeding and spun pale cocoons for overwintering. No clear external evidence of the larvae's presence in the petioles was visible, but internally the thimbleweed petioles contained some blackish discoloration around the larvae, apparently due to the presence of a symbiotic fungus. R.J. Gagné (pers. comm.) examined examples from both host plants, and determined that they belonged to the genus *Neolasioptera*. It is not known whether larvae from the two different hosts belong to the same species of *Neolasioptera*.

Furthermore, in late August 2025 I found a browned area on a basal leaf petiole of thimbleweed growing along my driveway. A single small exit hole was visible in the center of the browned area. Dissecting the petiole at this point revealed a spent cecidomyiid cocoon inside, with its anterior end opening into the exit hole. I was then able to extract the larva's spatula from inside the cocoon and photograph it, confirming the identification to family level.
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Angelica

[0061 - Angelica]
I noted larval tunnels winding through the layer of whitish tissue lining the interior of a hollow stem of the host. Puparia were formed in these stem tunnels, and the wide separation distance of the puparium's posterior spiracular plates (about twice their diameter) along with their central horns fit well with the description of *Melanagromyza angelicae* in Spencer and Steyskal (1986). I successfully overwintered puparia, and one or more adults emerged the following spring; O. Lonsdale identified them to species (Eiseman 2023, Eiseman et al. 2026).
...
Eiseman, C.S. 2023. Comment on contributor post at BugGuide.net. Retrieved March 10, 2024 from [URL : https://bugguide.net/node/view/1621184 : end URL].

Eiseman, C.S., Lonsdale, O., Feldman, T.S., and J. van der Linden. 2026. Thirty-three new species of Agromyzidae (Diptera) from the United States and Canada, with new host and distribution records for 154 additional species. Zootaxa 5745(1): 1-265.

Spencer, K.A. and G.C. Steyskal. 1986. Manual of the Agromyzidae (Díptera) of the United States. U.S. Department of Agriculture, Agriculture Handbook No. 638, 478 pp.

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[0060 - Angelica]
Larvae, pupae, and adults may be found within brownish tunnels in the interior collar of tissue in basal leaf petioles of the host in August. The body of the larva is whitish, the head capsule dome-shaped and light brown with darker mandibles and eyes, and where legs would be expected there are six fleshy knobs on the underside of the thorax. The long curved snout and large eyes of the adult are visible on the pupa. I observed and photographed this insect in 2018, and BugGuide.net contributors used my photos to identify the adults to subfamily and then genus (Luk 2019, Belov 2023).
...
Luk, S. 2019. Comment on contributor post at BugGuide.net. Retrieved March 10, 2024 from [URL : https://bugguide.net/node/view/1640441 : end URL].

Belov, V. 2023. Comment on contributor post at BugGuide.net. Retrieved March 10, 2024 from [URL : https://bugguide.net/node/view/1640441 : end URL].

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Apios

[0062 - Apios]
My initial observations of this fly occurred in 2021 and 2022. The larva tunnels in the stem interior of the host. It shows a conspicuous hooklike process in front, probably a rather enlarged mouthhook but further study is needed. The bulbs of the posterior spiracles are arranged palmately in a projecting, three-dimensional semicircular fan, a rather exceptional configuration among the dozens of stem-boring Agromyzidae I have studied in this survey.

The puparium is unusually narrow for its length, dome-shaped anteriorly and tapering noticeably to the posterior. Its curious shape is similar to that of the agromyzid borer in *Desmodium* (record {0192, 0194}), which host is, interestingly, also in the Fabaceae. The puparium overwinters, and adults emerge in spring.

Adults are black overall, lacking appreciable iridescence on the abdomen. They show some limited brownish coloration on the lateral surface of the thorax near where the wing attaches. The haltere has a black knob and a brown stem.
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[0063 - Apios]
I noted stem galls inhabited by this species in October 2022. The galls were approximately 15mm long, subglobose to ovoid, hard, and light brown in color, with shallow longitudinal furrows on the surface. Each gall contained several larvae in individual blackened or browned chambers formed in the pale greenish-white interior tissue of the gall. Larvae were orange with a reddish spatula having two prominent teeth on its anterior end. In their chambers in the galls, the larvae spun cocoons for overwintering. Cocoons were whitish and roughly 4mm in length. An adult emerged from an overwintered gall in spring, and its general appearance and the observed characteristics of the larvae are consistent with *Neolasioptera*.
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Apocynum

[0064 - Apocynum]
I found a larva mining a stem of the host in mid-July. The mining resulted in a blotchy brownish or reddish discoloration to the surface of the stem. There was no clear pattern to the deposition of frass in the mine.

I was also able to locate the oviposition site in this stem. It consisted of a round oviposition hole in the stem epidermis, the edges of the hole curled upward/outward to form a slight collar around the hole, the collar oriented at a less than 90-degree angle relative to the long axis of the stem, suggesting the egg was inserted obliquely and not straight down. The collar was a brownish color, as was a small oval patch of tissue between the hole and the start of the mine, this patch apparently being the location where the egg was placed under the epidermis. Away from this location led the beginning of the stem mine, linear and slightly raised but not discolored relative to surrounding stem tissue, and approximately twice as wide as the diameter of the oviposition hole.

The larva, nearly mature when I collected the plant material, was visible through the stem epidermis as it fed. The posterior portion of the larva's cephaloskeleton appeared as if divided into 3 parts rather than 2, indicating the larva belonged to the subfamily Agromyzinae. When finished feeding, in captivity, the larva thrust its body partway out of the stem and pupariated in this position, with the anterior half of the puparium protruding from the mine through a hole in the epidermis at a 45-degree angle to the long axis of the stem. The puparium was straw-colored with a pair of black anterior spiracles borne on stalks. I was not able to rear the adult fly.
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Aquilegia

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[0067 - Aquilegia]
I found a young larva in a senescent stem of the host in late October, 2022. It was pale whitish with darker mandibles and a pair of very short urogomphi. I successfully overwintered it and reared it to maturity over the following spring and summer.

At first, when I removed the larva from refrigeration in early March, I held it in a short piece of the original columbine dead stem, but it eventually tunneled out most of the contents of this stem piece, so I inserted the entire stem piece, with larva inside, into a larger, hollow but still somewhat pithy section of *Campanulastrum americanum* dead stem. By late May there was significant frass accumulation inside the *Campanulastrum* piece, indicating the larva had been feeding; close examination of the plant material suggested the larva had eaten more of the columbine stem, fed on at least one of the two woody dead twig stubs that were being used as caps for the *Campanulastrum* piece, and consumed some of the pithy lining of the *Campanulastrum* piece. I then removed the remnants of the columbine piece, inserted a section of pithy *Echinacea* dead stem into one end of the hollow *Campanulastrum* piece containing the larva, and capped the other end of the *Campanulastrum* piece with more *Echinacea*. The larva finally completed its feeding and pupated in this habitat, and the adult emerged in mid-August.

The elytra of the adult were a rather uniform orangish-brown color, while the underside of the thorax and abdomen were a combination of reddish-brown and dark brown, and the eyes were blue-gray. I was able to photograph the series of ridges on the rear leg, which can be useful for identification purposes in the family Mordellidae (Bartlett et al. 2023). The adult was identified to genus by Belov (2024) via photos on BugGuide.net.
...
Bartlett, T., cotinis, Moisset, B., Gross, J., Harpootlian, P., Moyer, T., Büche, B., and V. Belov. 2023. Family Mordellidae - tumbling flower beetles. Family info page on BugGuide.net. Retrieved December 2, 2023 from [URL : https://bugguide.net/node/view/144 : end URL].

Belov, V. 2024. Comment on contributor post at BugGuide.net. Retrieved March 10, 2024 from [URL : https://bugguide.net/node/view/2316552 : end URL].

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[0066 - Aquilegia]
In late August 2021, I noted a borer tunnel in the interior of a basal leaf petiole of the host. The tunnel was approximately 15mm long, brownish in color, with no significant solid frass accumulation. It appeared to originate beneath an externally visible oviposition hole in the outer wall of the petiole, the hole surrounded by a thin collar of whitish tissue and raised slightly above the level of the surrounding tissue. It was not clear if the tunnel was aborted or if it led into the crown or roots of the plant.

At the same time the following year, I found a somewhat similar tunnel in the interior of a stem near ground level. The tunnel walls were somewhat ragged, similar to dipteran tunnels from other hosts. An elongate, dessicated object in the tunnel could not be conclusively identified, but it appeared to consist partly of small discs that were reminiscent of the calcareous discs I have observed in the bodies of agromyzid larvae. For more on these discs, see Ellis (2024).

Finally, I observed tunneling consistent with Diptera in the very base of a overwintered dead stem of the host in early spring.

Together, these observations suggest a fly borer that conducts brief feeding in the lower part of a main stem or leaf petiole and then migrates to the roots, where it completes the bulk of its activities. Because no puparia have yet been found in stem interiors, I assume that pupation occurs in the roots or off the plant.
...
Ellis, W.N. 2024. Agromyzidae. In Plant Parasites of Europe [website]. Retrieved June 19, 2024 from [URL : https://bladmineerders.nl/parasites/animalia/arthropoda/insecta/diptera/brachycera/agromyzidae/ : end URL].
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[0065 - Aquilegia]
In the first example of this miner examined in the current study, I located the stem mine but it was not immediately clear if the insect itself was still present. The mine, observed in late August 2021, was very subtle and difficult to discern except for small but conspicuous black lumps or short strips of frass scattered along its length. The lumps were rather amorphous in shape and the short strips alternated between the parallel sides of the mine. By following these agglomerations of frass I was able to track the mine from its apparent starting point near the top of a peduncle down to the base of the main stem. In addition to the scattered lumps and short strips of frass, parts of the mine also showed subtle reddish-brown discoloration, sometimes including a pattern of repeating semicircular marks left by the larva's mouthparts as it fed.

Closer examination of the plant material revealed a puparium appressed to the stem, wedged between the petiole of a basal leaf and the very base of the stem. The puparium was formed externally, less than a millimeter away from an exit slit in the stem epidermis. It was a light reddish-brownish color, somewhat dorsoventrally flattened, with anterior and posterior spiracles both held on short stalks; the anterior spiracles were black.

In a similar stem mine found in early August the following year, I managed to locate the oviposition site in the peduncle. It consisted of (1) a round hole in the epidermis partly surrounded by a raised collar of tissue, (2) a small area immediately adjacent to the hole that showed no discoloration relative to the surrounding stem tissue but was evidently the location where the egg had been placed under the epidermis, and (3) the beginning of the stem mine, a pale, whitish track leading away from the egg location. Further down the peduncle from the egg-laying site, the mine assumed a more subtle yellowish color with traces of reddish-brown discoloration; it also contained alternating lumps of black frass.

Additionally, in mid-September 2022 I located a puparium near the base of a main stem of the host. It was black in color and formed underneath the stem epidermis, and its posterior spiracles resembled those of the first example.

The overall body shape and the general spiracle morphology of the 2021 and 2022 puparia resembled those of *Ophiomyia* spp. I observed on other host plants, but I did not rear adults. The peduncle mining I found appears somewhat similar to that found by E. LoPresti on *Aquilegia eximia* in California, as reported in Eiseman (2022).
...
Eiseman, C.S. 2022. Leafminers of North America, 2nd edition. Self-published e-book. Available from the author at [URL : https://charleyeiseman.com/leafminers/ : end URL].

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Arabidopsis

[0068 - Arabidopsis]
I found tentatively identified stem mines of this species in late September. They contained alternating narrow strips of black frass. Pupation is evidently off the plant, as there were no puparia in the mines.
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Aralia
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[0071 - Aralia]
The bright golden puparia of this large agromyzid species may be found in the pith of dead stems of the host in winter or early spring. I reared several adults in spring, along with ichneumonoid parasitoids. Judging by the position of some puparia partly buried within the remains of the stem interior tissue, the larvae probably tunnel in the tissue but could conceivably also graze on the lining of any hollow areas within the stem.
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[0069 - Aralia]
I located a young larva in August, in a tunnel in a leaf stalk of a living plant. I also found a second larva in late May; it had overwintered in the senesced plant material (the exact nature of which I did not record, but it was either a leaf stalk or a stem). The latter individual emerged as an adult in early June. As an adult, it was a rather uniform reddish-orange color overall, with very fine pubescence on the elytra.
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[0070 - Aralia]
I observed four plants with leaf stalk mines in a colony of the host plant in 2021. The mine on one of these plants appeared to begin at the base of one of the leaflets, then proceed down the leaflet stalk to the main stalk or petiole of the leaf. A black puparium had been formed under the epidermis in the distal portion of the petiole, just below the point where the leaflet stalks attached. No puparia were visible in the mines on the other three plants. Observations of similar mines at a location outside the study area suggested that this fly may sometimes move into the rhizome and pupate there.
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Arctium

[0073 - Arctium]
I found a long, contorted stem mine with a central frass line on a dead stem in winter, the larva having mined the stem while it was still alive during the previous growing season. The mine appeared to have originated in the petiole of one of the stem leaves. I am tentatively attributing this record to *Marmara* sp. based on close similarities with known *Marmara* stem miners in other hosts.
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[0072 - Arctium]
This agromyzid tunnels in the interior of basal leaf petioles during summer. Freshly formed yellow or yellowish-brown puparia occur in late July. In one example I observed, the larva formed its puparium in a tunnel that led from the petiole interior to just under the petiole epidermis, and the anterior spiracles of the puparium penetrated the epidermis. An adult female emerged in early August, 2022.
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[0074 - Arctium]
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In 2023, I found a rather active larva of this cecidomyiid in the pith of a lower stem in winter. There was no obvious discoloration of the pith or outward sign of the larva's presence.
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Arnoglossum

[0075, 0078 - Arnoglossum]
I found puparia and a larva in stems of *A. reniforme* and *A. plantagineum*, with one or more adults reared from both hosts. In *A. reniforme* the larval tunnels were formed in the pithy inner lining of the hollow stems, while in *A. plantagineum* the relatively solid pith was riddled with the tunnels of several larvae per stem. Puparia from both hosts possess fairly strong black horns on the black posterior spiracular plates. It appears that the puparium is the typical overwintering stage. *M. arnoglossi* was described in Eiseman et al. (2021) using adults reared from *A. reniforme*.

A probable *Melanagromyza* that I believe to be a different species than *M. arnoglossi* tunnels in basal leaf petioles of *A. reniforme* in my study area (record {0686}). The anterior and posterior spiracles of its puparium are noticeably different from those of *M. arnoglossi*.
...
Eiseman, C.S., Lonsdale, O., van der Linden, J., Feldman, T.S., and M.W. Palmer. 2021. Thirteen new species of Agromyzidae (Diptera) from the United States, with new host and distribution records for 32 additional species. Zootaxa 4931(1): 1–68.

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[0080 - Arnoglossum]
In early July, 2018, I noted a larva tunneling in a stem. It possessed a single white dorsal stripe on the first few abdominal segments.
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[0077 - Arnoglossum]
I discovered a dead larva in its tunnel in an upper stem, along with several cocoons with live pupae inside, in the interiors of dead stems of the host in late winter. The larva possessed a shiny black head capsule and thoracic shield along with a scattering of long setae on the body segments. Pith damage in the inhabited stems indicated that larvae had tunneled in the upper stems or excavated the pith lining the inner walls of lower stems. The cocoons were oval and somewhat flattened, formed of silk covered in a neatly arranged layer of yellowish-brown frass, and they opened into an exit flap formed in the epidermis of the stem. The pupa was thrust through the exit flap upon the adult's emergence in spring. Adults, reared in 2023, have not yet been identified beyond family level.
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[0076, 0079 - Arnoglossum]
I located an old, abandoned mine on a senescent stem of *A. ?reniforme* in November 2017, and active mines on leaf petioles and stems of *A. plantagineum* in early July 2018. The *A. plantagineum* mines were of the typical *Marmara* form, long, winding, and linear with a central frass line. In mid- to late July, a mature larva exited one of the *A. plantagineum* mines and spun a cocoon festooned with bubbles on the side of the rearing container. The adult emerged by mid-August.

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[0686 - Arnoglossum]
Tunnels of this agromyzid occur in basal leaf petioles of the host. In one example observed, the tunnel system wound through much of the length of the petiole and even extended into some of the major veins of the leaf. The tunnel walls showed a ragged texture.

In 2021 I found several puparia in petioles, usually one or two per petiole. In 2023 I found tunneling in the lower portion of a petiole that appeared to be agromyzid in origin, and in 2025 I found a single additional puparium in a petiole.

In the 2021 findings I observed the placement of the puparia within the petioles. In each case the puparium was formed in a tunnel that led from the petiole interior to the surface tissues, with the puparium positioned just behind a roughly circular, transparent operculum of petiole epidermis that sealed off the end of the tunnel from the outside world.

One of the 2021 puparia whose characteristics I recorded was straw-colored with brownish posterior spiracular plates without obvious horns. Interestingly, the spiracular plates were borne on short lobes that were subtly but noticeably different in color from the surrounding surface of the puparium, and the anterior spiracles were unusually large and perhaps even more prominent than the posterior spiracles, both somewhat unusual features among stem borer agromyzids I have examined in this study. Furthermore, the arrangement of the posterior spiracles and the prominence of the anterior spiracles in the 2021 puparium appeared to match the same features in the 2025 puparium. These characteristics are significantly different from those shown by the puparium of *M. arnoglossi* (record {0075, 0078}, so I suggest the petiole tunneler is a different species.

I have not yet reared adults, but they apparently emerge in spring from overwintered puparia.
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[0778 - Arnoglossum]
In late fall, I located a spindle-shaped swelling (~35-45mm in length) in the distal portion of a basal leaf petiole, just below the base of the leaf blade. The shape of the swelling and the internal fungal blackening it contained were both typical of *Neolasioptera*, but I did not open the swelling enough to observe larvae directly.
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Artemisia

[0754 - Artemisia]
I found a young larva tunneling in a stem of the host in 2025, but did not attempt to rear it to adulthood.
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[0081 - Artemisia]
A growing shoot of the host contained a larva tunneling in its interior in mid-May, causing the shoot to droop conspicuously. I transferred the larva to a carrot, in which it grew to

maturity, with the adult emerging in mid-October. A. Brees and M. Kenne examined photos of the adult, and suggested *P. maritima* and *P. nebris* as candidates for the species-level identification (pers. comm., 2018).
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[0082 - Artemisia]
I discovered apparent tortricid larvae in small spindle-shaped galls on upper stems of white sage (*A. ludoviciana*) in late June and early July. By late July, in a collection of stems bearing these galls, one of the apparent gallmaker larvae had emerged from the gall and begun tunneling into the stem at a point several centimeters below the gall.

In spring, I found mature tortricid larvae in overwintered dead stems of the same host. The larvae had hollowed out significant portions of the stems, which resulted in accumulations of dry pellets of frass in the galleries. Photographs show one of these mature larvae inside a dead stem that also bore the remains of one of the spindle-shaped galls near its apex. A larva from this batch pupated in spring and the adult emerged in the final days of May, 2018.

Based on this evidence, I concluded that the gallmaker and the stem borer are the same species, and that the galls harbor young larvae for a short time, but then these larvae exit the galls, crawl down the stems, and bore into the lower portions of the stems, where they continue feeding and eventually overwinter. This conclusion is perhaps supported by Brown et al. (1983), who report *E. benignatum* as a "gall maker on stem[s]" of *A. dranunculus* (p. 224) and who also state that some larvae reared from *A. vulgaris* did not cause visible swelling in the stems.
...
Brown, R.L., Clarke, J.F.G., and D.H. Habeck. 1983. New host records for Olethreutinae (Tortricidae). J. Lep. Soc. 37(3): 224-227.

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[0717 - Artemisia]
On June 3, a current-year living stem of the host (tentatively identified as either *A. campestris* or *A. dracunculus*) showed at least three holes along its length, opening into chambers or tunnels in the stem interior (whose exact nature I did not record). The holes were neatly round, roughly 2mm in diameter with rather crisp edges, and they were spaced about 40-60mm apart along the length of the stem. I did not observe the culprit, nor discern its feeding mode (stem borer vs. local feeder).

A *Papaipema* occurs in stems of *Artemisia* at the same site (record {0081}), and given that *Papaipema* larvae often make frass expulsion holes in the stems they occupy, I could not rule this out as the responsible insect, although the holes appeared more to me like exit holes made by emerging adults of a smaller-sized insect. A large group of *Rhopalomyia* spp. (Cecidomyiidae) is known from *Artemisia* spp. (Gagné 1989), but as far as I know none has been recorded as a cryptic local feeder in stems in this manner, and if this were a *Rhopalomyia*, it would have needed to develop rapidly in elongating, immature stem tissue in order to emerge as adults from current-year stems by early June.
...
Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

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Asarum

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[0083 - Asarum]
I discovered several larvae of this cecidomyiid in blackened chambers inside rhizomes of the host. The chambers were rough-walled and appeared to be lined with a whitish symbiotic fungus. Each larva had surrounded itself with a pale cocoon that was sometimes up to half again as long as the larva at rest inside it; the cocoon was thin enough that the larva's outline and orange color could be seen through it. There was no immediately obvious external sign of the larvae's presence. Ray Gagné examined the specimens and determined them to be a species of *Neolasioptera*, a first for this host (pers. comm., 2021).
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Asclepias

[0084, 0087 - Asclepias]
I observed sign of milkweed stem weevils in living and dead stems of common milkweed in 2023 and 2025, and I also observed damage to clasping milkweed (*A. amplexicaulis*) in 2016 that I am tentatively placing here, despite lacking certainty about the culprit.

A dead stem of common milkweed collected in January 2023 contained signs of adult activity and larval feeding from the previous growing season. The stem had a conspicuous, straight and elongate, blackened scar on its exterior that appeared to be the result of numerous holes chewed in a vertical line. Larval excavation in the pithy stem interior was contiguous with this scar and appeared to be limited to the area between two nodes, as was reported for *R. lineaticollis* by Agrawal (2005) and Nixon (2015).

In early August, 2023, I observed the interior of a stem into which a weevil had oviposited earlier in the summer. The stem had apparently already been evacuated by its weevil larvae. The tunneled area was blackened and contained some dark brown, granular frass along with at least two puparia of a fly, probably Chloropidae (see also below).

Later, in mid-June 2025, I found common milkweed stems in my yard that bore fresh oviposition scars. One such scar consisted of a broad, vertical linear channel cut into the surface of the stem along its long axis, the channel approximately 22mm in length and 3mm wide, with several round pits then gouged through the floor of the channel, arranged in a vertical row and penetrating deeper into the stem. Closer examination of two of these pits revealed a single egg deposited in the bottom of each one. The egg was a pale yellow spheroid, shiny and plump.

Also, in late fall 2025 I opened a few dead stalks of common milkweed that had been damaged by the weevils. In one stem, below the blackened area partly filled with the weevil larvae's frass, there was a stretch of tunnel that had essentially no pith remaining, but which contained several dark red, cylindrical fly puparia, less than 1 cm in length, attached to the inner wall of the stem. These appeared similar to the puparia from the August 2023 collection of live stems. These flies may be a secondary feeder on the weevil frass or (perhaps more likely) weevil-damaged necrotic pith.

Finally, in late June 2016, I noticed wilting stems of *A. amplexicaulis* in a remnant prairie that had been mostly hollowed out by an insect borer, with a single pale grublike larva found in its tunnel at the base of one of the stems. I did not photograph or examine this larva in detail, so the observation is only tentatively ascribed to *Rhyssomatus* sp.
...
Agrawal, A.A. 2005. Natural selection on common milkweed (*Asclepias syriaca*) by a community of specialized insect herbivores. Evolutionary Ecology Research 7: 651-667.
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Nixon, P. 2015. Milkweed weevils. In Home, Yard & Garden Pest newsletter, issue 6, June 1, 2015. Retrieved July 2, 2024 from [URL : https://hyg.ipm.illinois.edu/article.php?id=693 : end URL].

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[0085 - Asclepias]
I found a winding linear mine in the lower portion of a dead stem in winter, the mine having been constructed during the previous growing season while the stem was still alive. There was some indication of a central frass line, suggestive of *Marmara* sp., but the evidence was insufficient to make a clear identification. The mine appeared to proceed into the crown or belowground parts of the plant.
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[0086 - Asclepias]
The bright orange larva of this cecidomyiid overwinters in a locally blackened area in the pith of the dead stem. The blackening of the pith is apparently due to the presence of a symbiotic fungus (see Gagné (1989) for more on such insect-fungus relationships).

In examples I examined in winter 2022-2023, the affected areas occurred at nodes in the upper stem, and each larva (one per node) was ensconced within a cylindrical chamber or cocoon with a curved anterior portion leading to the outer wall of the stem. I did not record any significant swelling of the affected nodes.

However, in winter 2025-2026 I came across an apparently inhabited plant in which the inhabited nodes occurred on lateral branches and showed noticeable swelling relative to the unaffected tissue, resulting in subtle spindle-shaped galls. In one of these galls, a tiny oval hole could be seen in the outer wall of the stem, which was covered with a material that looked like silk from what I was able to discern. The size and shape of the hole compared favorably with *Neolasioptera* exit holes I've noted in stems of other host plants. If indeed an exit hole for the gall midge larva inside, the apparent fact that it was made before winter and then covered with a layer of silk was consistent with my aforementioned stem dissections from 2023 showing that the larval cocoons have a curved portion that connects with the outer wall of the stem. The larva must construct the exit hole, and curved cocoon leading to it, before winter and obscure the hole with silk, spend the winter in the cocoon, then pupate in the cocoon in spring, with the pupa pushing out through the silk operculum upon the adult's emergence.
...
Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

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Asparagus

[0634 - Asparagus]
In 2023, I located linear mines on lower stems of the host in a garden bed in October, probably at least a month after the mines had been formed. In some cases, the mines were very narrow and pale green, while in other cases, the mines (evidently made by older larvae) were wider and whitish or light brown in color, with red discoloration along the margins. I examined one mine that contained the remains of a spent puparium under the epidermis of the stem, about 20cm above ground level. Tentative identification based on Spencer and Steyskal (1986).
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Spencer, K.A., and G.C. Steyskal. 1986. Manual of the Agromyzidae (Díptera) of the United States. U.S. Dept. of Agriculture, Agriculture Handbook No. 638.

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Baptisia

[0088 - Baptisia]
I found larvae overwintering in dead stems of the host in a remnant prairie in late April, 2018. They had fed in the pith while the stems were still alive in the previous growing season. Larval tunnels occasionally strayed near the surface of the stem, resulting in short, irregular, externally visible mines, before reentering deeper tissues. Tunnels in the stem interior showed extensive accumulation of fine powdery frass. Adults emerged in early June. Using photos, Belov (2020) identified an adult to tribe on the BugGuide website.
...
Belov, V. 2020. Comment on contributor post at BugGuide.net. Retrieved July 2, 2024 from [URL : https://bugguide.net/node/view/1614330 : end URL].

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Barbarea

[0089 - Barbarea]
Larvae excavate shallow, externally visible tunnels in leaf petioles and stems, leaving the epidermis intact. The damage is most common in lower stem leaves and basal leaves, on the underside of the petiole near its base.

The mature larva possesses a pair of short, curved, sclerotized hooks or spines on its posterior end. Larvae kept indoors exited the plant material when done feeding and pupated in the potting mix provided in the bottom of the rearing container.

In 2021, I reared adults in early June from larvae collected in mid-May. Based on photos of one of these adults, BugGuide users B. Büche (2024) and V. Belov (2021) contributed to the identification.

I also observed larvae in lower leaf petioles in 2024.
...
Belov, V. 2021. Comment on contributor post at BugGuide.net. Retrieved July 2, 2024 from [URL : https://bugguide.net/node/view/1979350 : end URL].

Büche, B. 2024. Comment on contributor post at BugGuide.net. Retrieved January 26, 2026 from [URL : https://www.bugguide.net/node/view/1979350 : end URL].

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[0090 - Barbarea]
In late April, 2021, I observed whitish, blotchy leaf mines of this species that sometimes entered the midrib or petiole. Mines consistently occurred on the lowest leaves of the host plant, including basal leaves. I reared an adult in early May. The mine keys to *Scaptomyza flava* in Eiseman (2025).
...
Eiseman, C.S. 2025. Leafminers of North America, 3nd edition. Self-published e-book. Available from the author at [URL : https://charleyeiseman.com/leafminers/ : end URL].
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[0738 - Barbarea]
I observed *Ophiomyia* stem mines and puparia on a cruciferous plant tentatively identified as *B. vulgaris* in early August, 2024. At least 2 puparia, both spent, were present under the epidermis at the ends of their stem mines. Photos of the host plant are available at [URL : https://www.inaturalist.org/observations/336308547 : end URL].
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Berteroa

[0091 - Berteroa]
I observed a stem of the host that contained two affected areas. In each affected area, a limited amount of tunneling was present in a localized region of the pith adjacent to a node. The tunneling connected directly to a round hole in the leaf scar where the petiole of the stem leaf had formerly been attached. I hypothesized that the insect had begun its activity in the petiole of the stem leaf, then tunneled into the stem from there, where it had evidently completed this part of its development and then exited the plant.

Culprits were absent by the time I noted the damage in early September.
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[0092 - Berteroa]
I observed mines on stems of the host in early September. They were a dark grayish color, in contrast to the green color of the healthy tissue. One mined stem that I more closely examined contained a black puparium under the stem epidermis, with the anterior spiracles projecting through the epidermis.
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Betula

[0093 - Betula]
I found a yellowish-orange larva in an elongate swelling near the base of a leaf petiole in late August. Identification is based on the account on p. 162 in Gagné (1989).
...
Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

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Bidens

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[0095 - Bidens]
I found a dead adult of this weevil in a tunnel in the pith of a dead stem of the host in winter.

The adult was positioned right at the end of the tunnel, just behind an exit hole covered in an operculum of stem epidermis that appeared to be intact and not perforated. It seemed very likely the larval form of the insect had created the tunnel and pupated inside it, and then the adult had simply died prior to emerging from the stem, but this was not directly observed. Nearby in the same stem, a similar tunnel ended in a similar exit hole whose operculum had been perforated, and the insect was no longer present. Later that same winter, I discovered comparable tunnels, all of them also evacuated, in several other dead stems of the host at the same location. These observations would seem to lend credence to the hypothesis about the first individual.

The adult (first individual) was a very small, black weevil with a long, curved rostrum and a notably arched body. The tunnel contained scattered grains of dark brown solid frass, which contrasted sharply with the white color of the surrounding pith.

Apion prob. *melanarium* has been previously recorded from stems of *Bidens cernua* in Illinois (Tuttle 1952).
...
Tuttle, D.M. 1952. Studies in bionomics of Curculionidae. University of Illinois at Urbana-Champaign [PhD thesis]. Retrieved January 26, 2026 from [URL : https://www.proquest.com/openview/2d614291d036d05560b74e955288503b/ : end URL].

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[0094 - Bidens]
In early September, 2017, plants growing in a wetland in the study area contained extensive internal excavations in flower buds, shoots, and stems, with some of the tunneled areas containing weevil larvae. Adults emerged from this plant material in late September. Using photos, B. Mathison and V. Belov (2017) identified an adult to species on the BugGuide website.
...
Mathison, B. and V. Belov. 2017. Comments on contributor post at BugGuide.net. Retrieved July 2, 2024 from [URL : https://bugguide.net/node/view/1471526. : end URL].

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[0796 - Bidens]
An adult of this weevil emerged from the lower end of an 11" piece of stem that I had been keeping in a rearing container because I had discovered a Lepidoptera larva (apparently *Epiblema otiosana*, record {0096}) tunneling in the upper end. I collected the stem on 25 July and the adult weevil emerged on 03 September. In a review of my notes from that rearing, the fate of the caterpillar from the same stem was unclear.
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[0096 - Bidens]
I found a young larva tunneling in a living stem in late July, and a mature or nearly mature larva overwintering in its tunnel in the pith of a dead stem in winter. Both of these are tentatively placed to Tortricidae based on similarities with confirmed tortricids from other hosts, and the most likely identification is *Epiblema otiosana*, which has been well documented by other workers as a stem borer in this host (see below).

Interestingly, many dead stems of the host are raided by birds in the dormant season, apparently in order to find these larvae overwintering inside. In one wetland I explored in winter, birds had drilled repeatedly into hundreds of robust hostplant stems that were still standing from the previous growing season, representing an overwhelming and systematic predatory effort.
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At a different location, a tunnel evidently made by this insect in one dead stem contained a parasitoid wasp larva with a distinctively striped head capsule, along with what appeared to be a remnant head capsule of the host larva. I reared an adult wasp from the parasitoid larva.

Decker (1932) describes the life history of this moth in detail, including parasitoid fauna, and Smiley (2019a&b) provides excellent photographs of several life stages.
...
Decker, G.C. 1932. Biology of the *Bidens* borer, *Epiblema otiosana* (Clemens) (Lepidoptera, Olethreutidae). Journal of the New York Entomological Society 40(4): 503-509.

Smiley, G. 2019a. *Epiblema otiosana*. Contributor post at BugGuide.net. Retrieved July 2, 2024 from [URL : https://bugguide.net/node/view/1706352 : end URL].

Smiley, G. 2019b. *Epiblema otiosana*. Contributor post at BugGuide.net. Retrieved July 2, 2024 from [URL : https://bugguide.net/node/view/1725111 : end URL].

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[0792 - Bidens]
I observed these galls erupting laterally from stems of the host in mid-August. They appear to match the “soft, lateral, globular outgrowths of stem” reported for *Bidens* on pg. 128 of Gagné (1989) and ascribed to an unnamed *Asphondylia* sp.
...
Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

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Blephilia

[0098 - Blephilia]
I observed and photographed an adult female as she appeared to oviposit into a stem of the host in late June. She chewed three rows of holes or pits that encircled the upper stem and a fourth row several centimeters below these, then gouged out a single shallow pit at a point on the stem between the two girdled areas. She briefly inserted her ovipositor into this lone pit, then flew off. I have not yet observed larvae.

The stem damage and overall appearance of the adult were somewhat similar to those of the *Oberea* I have reared from *Monarda* (record {0334}).
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[0739 - Blephilia]
In early January 2025, I found an orange larva of this lizard beetle overwintering in a dead stem of the host just above ground level. Over the course of its feeding activities, it had eaten away most of the pith layer lining the interior of the hollow stem. The larva had compacted the resulting frass into a few short (less than 20mm long) and very dense rods, isolated from one another by stretches of empty tunnel 100mm or more in length.

The larva pupated in the stem and the adult emerged in spring. It left behind an elongate-oval exit hole in the stem, whose long axis was parallel to the long axis of the stem, as was typical of erotylid borers I encountered in this study. All characters of the larva and adult I observed were consistent with *A. gracilis*.
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[0099 - Blephilia]
In late July 2022, I discovered a mordellid larva in a stem that had been collected with several other stems of the host in late June and held in a rearing container.

I also found mature or nearly mature larvae overwintering in the lower portions of dead stems in early April, accompanied by their feeding sign in the stem interiors from the previous growing season.

I reared an adult from the batch of overwintering larvae in late April, and the pattern of pubescence on its elytra appeared to be consistent with that of *Mordellina pustulata*. Similar-looking adults emerged from stems of other mint family plants in this study (i.e., from *Mentha arvensis*, record {0329}; from *Agastache* sp., record {0016}), and I have also reared a mordellid from *Monarda* (record {0652}), though I did not record what the adult looked like.
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[0100 - Blephilia]
Larvae tunnel in the pithy inner lining of the stems, with puparia formed in the tunnels. A photographed puparium was straw-colored, with light brownish posterior spiracular plates separated by approximately twice their width, and spiracular horns not clearly discernible (thus either very small or not present).

Adults emerged from overwintered puparia in spring. Photographs of one male adult show a bronze iridescence on the abdomen. Eiseman et al. (2026) formally described the species.
...
Eiseman, C.S., Lonsdale, O., Feldman, T.S., and J. van der Linden. 2026. Thirty-three new species of Agromyzidae (Diptera) from the United States and Canada, with new host and distribution records for 154 additional species. Zootaxa 5745(1): 1-265.

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[0103 - Blephilia]
I found a young larva tunneling in a wilted stem in mid-May, and another larva in a similarly wilted stem in late June. In the June example, the larva dwelled in the lowest reaches of the stem just above the roots, with a frass expulsion hole in the wall of the stem roughly 5 cm above ground level. There was definite sign of tunneling higher in the stem as well, but little or no frass accumulation; evidently the larva had expelled almost all of its frass through the aforementioned hole.

I was also able to locate a spent pupa in a dead stem of the host in winter, the adult moth having apparently emerged late in the previous growing season. In this case, the affected stem showed a conspicuous hole roughly 10 cm above ground level; another ~15 cm above this point, the stem had lodged due to the presence of a second hole; this was evidently where the adult moth had emerged.

The pupal exuviae of the moth were positioned facing upward in the stem, about ~3 cm above the first (lower) hole. A partial larval head capsule accompanied some frass right below the same hole. The stem above the pupal exuviae also showed extensive pith scraping indicative of larval feeding. However, there was no frass in the stem except for the very small quantity accompanying the head capsule right below the lower hole. This was consistent with the observations during the growing season that suggested this species expels most of its frass from the stem.

I did not rear any adults.
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[0101 - Blephilia]
I located intact puparia of this species in late July and early August, under the stem epidermis at the ends of externally visible mines, mostly in middle to upper stems.

Puparia were also present on overwintered dead stems of the host in winter. The dead stem of one host plant individual had four lateral branches in its infructescence, and each of these four lateral stems contained a single overwintering puparium under the epidermis.

The larva commonly deposits its frass in isolated large black lumps, which can even be discerned on the dead stems in winter. The final lump appears to be often deposited right before pupation, as I came upon multiple instances in which a puparium was accompanied by such a lump positioned immediately adjacent to it in the mine, within less than 10mm of the puparium. (These frass deposition patterns were similar to those observed in *Ophiomyia* stem mines on *Monarda fistulosa* (record {0687}) and *Verbena urticifolia* ({0595}) in the current study.) The anterior spiracles of the puparium project through the stem epidermis.

I have not yet reared adults.

Ophiomyia labiatarum and *O. mimuli* have been previously recorded from several genera of Lamiaceae (Spencer & Steyskal 1986, Eiseman et al. 2026).
...
Eiseman, C.S., Lonsdale, O., Feldman, T.S., and J. van der Linden. 2026. Thirty-three new species of Agromyzidae (Diptera) from the United States and Canada, with new host and distribution records for 154 additional species. Zootaxa 5745(1): 1-265.

Spencer, K.A., and G.C. Steyskal. 1986. Manual of the Agromyzidae (Díptera) of the United States. U.S. Dept. of Agriculture, Agriculture Handbook No. 638.

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[0097 - Blephilia]
Feeding sign of this unique internal feeder may be found in the host plant's lower stems (including horizontal rooting portions of the lower stems) in fall and spring. The larva tunnels at various depths within a localized region of the stem, and the shallower tunnels result in faint grayish or blackish external discoloration along with blisterlike swelling of the stem epidermis in the affected area. The rest of the stem above and below this slightly swollen and discolored area appears unaffected both internally and externally. In some affected stems, larvae may also create more traditional linear stem mines that are formed just under the epidermis and are fully visible externally.

In 2021, I collected one affected stem on 28 October but did not fully dissect it in time to determine if it still held a larva inside. In 2023, I collected four affected stems on 9 May and 15 May. Three of these stems contained localized feeding areas that had already been abandoned by apparently mature larvae, who had each left a semicircular exit hole in the stem epidermis. The localized feeding area on one of the stems from the May 9th collection contained a late-stage larva feeding deep in the core of the stem. I photographed this larva *in situ* and then removed it from the stem for further photographs. I then transplanted it into a fresh length of *Blephilia* stem. The transplant was successful and the larva fed in the interior of the new length of stem for some time before abandoning it on or shortly before May 20, evidently in order to pupate.

Also in 2023, examination of the autumn growth of the host at the end of September revealed a single stem that had already been evacuated by the larva it had hosted. This suggested that some mature larvae could be active in summer or even early autumn, in addition to early spring.

I collected more affected stems at the start of the growing season in 2024, this time on 10 and 13 April (rather than in May) because of an early arrival of spring. One of these stems produced a single diminutive parasitoid wasp on 19 April. Larvae in the other stems

successfully finished their feeding, exited the stems, and spun rusty-colored, dorsoventrally flattened ovoid cocoons, with all cocoons completed before 25 April. A single adult emerged from one of these cocoons on 8 May. Two other cocoons produced braconid wasps belonging to the subfamily Ichneutinae, as identified from photos by Zuparko (2024). A pupa from a fourth, incompletely formed cocoon failed to reach adulthood, but was photographed as it matured.

As mentioned earlier, the finding of affected stems of autumn growth vacated by presumably mature larvae suggests that some larvae finish feeding before the end of their first growing season, perhaps overwintering as pupae in cocoons. However, the presence of other larvae in a nearly mature state at the very beginning of the growing season strongly suggests that these individuals had overwintered in the plant material as middle-instar larvae. Thus, there may be a broad period of time from late summer or autumn through early spring during which larvae mature. Based on the documented flight periods of several species of *Pseudopostega* known from the study area (Harrison 2023, Davis and Stonis 2007), I hypothesize that most or all individuals of this species emerge as adults in spring or early summer.
...
Davis, D.R. and J.R. Stonis. 2007. A revision of the New World plant-mining moths of the family Opostegidae (Lepidoptera: Nepticuloidea). Smithsonian Contributions to Zoology no. 625, 212 pp., 503 figs., 19 maps, 2 tables.

Harrison, T. 2023. Family Opostegidae. On Microleps.org [website]. Retrieved November 5, 2023 from [URL : http://www.microleps.org/Guide/Opostegidae/index.html : end URL].

Zuparko, R. 2024. Comment on contributor post at BugGuide.net. Retrieved June 6, 2024 from [URL : https://bugguide.net/node/view/2356671 : end URL].

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[0102 - Blephilia]
Stems inhabited by this local feeder may contort and/or swell slightly at the location where the larva dwells. Within the hollow stem at this location is a small cell that is visible internally as a pill-shaped outgrowth of the pithy inner lining of the stem. The larva lives within this cell, presumably overwintering here based on the finding of larvae in senescent stems in mid-October; adults would thus be expected in spring. R. Gagné examined larvae and determined them to belong to the genus *Neolasioptera* (pers. comm., autumn 2021). Photos of one larva show it had a rather short spatula, which featured an exceptionally broad anterior end crowned with two short triangular teeth widely separated by about three times their length.
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Boechera

[0106 - Boechera]
Four sprawling lateral stems of the hostplant I observed in late June 2023 contained extensive tunneling in the lower parts of the stems. There was generally little or no frass in the upper parts of the tunnels; in the lowermost parts, closest to the base of the stems, compacted frass could sometimes be found in abundance, but not in all tunnels examined. In one example, the bottom ~80mm of stem had been tunneled, and a parasitoid cocoon was found in the tunnel near its upper end, several centimeters from the discarded remains of the beetle larva that had evidently served as its host. In a second example, a tunnel contained a parasitoid cocoon right next to the host's remains. In each of these two cases the host's remains included the complete head capsule of the larva, which was clearly identifiable as Coleoptera. I did not observe live larvae or other stages of this borer.

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[0104 - Boechera]
Larvae tunnel in the pith. There may be more than one larva per stem. Pupation is internal, with the puparium evidently being the overwintering stage at least some of the time. Puparia show particularly strong black horns on the posterior spiracular plates, similar to those from *Thlaspi arvense* (record {0574}). Prior to pupation, the larva prepares an exit window in the wall of the stem, through which the adult eventually emerges.

In one extensively tunneled stem I examined in March 2022, three puparia were present: one that was apparently intact; a second, from which the adult fly had failed to emerge; and a third, from which the adult fly had apparently emerged during the growing season in 2021.
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[0105 - Boechera]
Larvae mine in leaf blades, midribs, and petioles. My observations suggested some larvae may move between leaves, either through the stems or by exiting old mines and establishing new ones. I reared adults in late May from larvae collected in early- to mid-May. More information: Eiseman and van der Linden (2024).
...
Eiseman, C.S. and J. van der Linden. 2024. New rearing records of Drosophilidae (Diptera: Ephydroidea) from plant tissue. Proceedings of the Entomological Society of Washington 126(2): 172-182.

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Bouteloua

[0107 - Bouteloua]
Senesced culms of the host grass in a remnant prairie in the study area hosted overwintering larvae of this hymenopteran local feeder in winter 2021-2022. An adult emerged from inhabited culms in spring 2022. The adult has not yet been identified, but externally it resembles Eurytomidae. Eurytomids in the genus *Tetramesa* are well known as the "jointworms" that feed in culms of grasses in many parts of the world, sometimes causing economic damage to cereals (Carr et al. 2020, Noyes 2004, Saghaei et al. 2018). A larva I photographed was located immediately adjacent to a node, which "joint" is a typical location for jointworms in culms. There was some limited dark discoloration to the culm interior in the vicinity of the larva.

Burks (1979) does not list any records of *Tetramesa* species using *Bouteloua* as a host, and I have been unable to find prior records elsewhere as well.
...
Burks, B.D. 1979. Eurytomidae. In Krombein, K.V., Hurd, Jr., P.D., Smith, D.R., and B.D. Burks (eds.). 1979. Catalog of Hymenoptera in America north of Mexico, vol. 1. Smithsonian Institution Press: Washington, D.C.

Carr, J.F., Eiseman, C.S., and V. Belov. 2020. Genus *Tetramesa*. Genus information page on BugGuide.net. Retrieved November 12, 2023 from [URL : https://bugguide.net/node/view/511692 : end URL].

Noyes, J.S. 2004. Notes on families: Eurytomidae. In Universal Chalcidoidea Database. World Wide Web electronic publication. Retrieved November 12, 2023 from [URL : https://www.nhm.ac.uk/our-science/data/chalcidoids/eurytomidae.html : end URL].
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Saghaei, N., Fallahzadeh, M., and H. Lotfalizadeh. 2018. Annotated catalog of Eurytomidae (Hymenoptera: Chalcidoidea) from Iran. Trans. Amer. Ent. Soc. 144:263-293.

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Brassica

[0108 - Brassica]
I noted several stem mines, one containing an actively feeding larva, on upper stems of the host plant in mid-August, when the host was in flower. I also discovered several black puparia overwintering under the epidermis of dead stems of the host in winter. It appears the puparium may be the typical overwintering stage, but the only thing I have reared from an overwintered puparium is a parasitoid wasp.

The identification of the host plant is tentative. Photos of the host plant are available here:

- Flowers: [URL : https://www.inaturalist.org/observations/336331883 : end URL]
- Flowers and fruit: [URL : https://www.inaturalist.org/observations/192430392 : end URL]
- Seedhead in winter: [URL : https://www.inaturalist.org/observations/192430583 : end URL]
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Bromus

[0109 - Bromus]
I found a larva in its tunnel in a culm of the host in mid-November 2022. The culm had lodged at a point about 20cm above ground level, and the larva was located in the base of the culm below the lodging point, near ground level. I successfully overwintered the larva, and the adult emerged in spring 2023, leaving behind a small oval exit hole in the culm. The adult was a more or less uniform reddish-brown color, not unlike adults of *Mordellistena* spp. I reared from other hosts, but it has not yet been identified beyond family level. This was my first record of a mordellid in a grass stem in the stem insect survey.
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Calamagrostis

[0767 - Calamagrostis]
In early November 2025 I found a mordellid larva in its tunnel in the lower culm of an ornamental bunchgrass from a garden bed in my yard. The host plant appeared to be a *Calamagrostis*, probably feather reed grass (*C*. x *acutiflora*).

The larva’s tunneling was most visible in the lowermost two or three internodes, betrayed by frass accumulation and signs of damage to the inner wall of the culm. A thin tunnel proceeded from the second-to-lowest internode through the node to the lowest internode, and
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the top of this internode was filled with a ~8-10mm rod of compacted frass. The larva dwelled below this frass rod near the base of the internode, facing up. It was a pale creamy color, whitish with a slightly yellowish or tan hue.
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Caltha

[0110 - Caltha]
This tentative record is based on a leaf mine and associated damage to a petiole, found in a wetland in late May. The leaf mine was a grayish irregular blotch radiating from the point where the petiole attached to the leaf blade, similar to what is shown for *Z. calthella* in Eiseman et al. (2016) and Eiseman (2016). According to those references, larvae feed in the petiole as well as the leaf blade, and the petiole mine may appear brown in color. The petiole of the leaf I examined did show extensive brownish discoloration, but I was unable to locate a larva.
...
Eiseman, C.S. 2016. Marsh marigold menagerie. BugTracks weblog. Retrieved June 27, 2024 from [URL : https://bugtracks.wordpress.com/2016/12/27/marsh-marigold-menagerie/ : end URL].

Eiseman, C.S., Heller, K., and B. Rulik. 2016. A new leaf-mining dark-winged fungus gnat (Diptera: Sciaridae), with notes on other insect associates of marsh marigold (Ranunculaceae: *Caltha palustris* L.). Proceedings of the Entomological Society of Washington 118(4): 519-532.

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Calystegia

[0111 - Calystegia]
I found the pale whitish larvae of this mordellid overwintering in dead stems of the host in winter, accompanied by brownish frass. The host plant was a convolvulaceous bindweed, tentatively identified as *Calystegia sepium.* I did not rear adults.
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[0112 - Calystegia]
Each larva of this borer appears to inhabit just a single leaf, tunneling out the interior of the petiole and sometimes part of the midrib as well. The walls of the tunnel have a noticeably ragged look to them. The leaf may wilt or shrivel and turn yellow or brown, betraying the presence of a larva at work in the leaf stalk. Some larvae prepare an exit shaft to near the surface of the petiole and pupate there, leaving the epidermis intact except for penetrating it with the anterior spiracles. The finding of other petioles with completed tunnels but no culprits present suggested that these leaves' larvae had exited the petioles and pupated externally, but this was not confirmed. I located the puparia formed in petioles during early- to mid-July.
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[0113 - Calystegia]

Larvae form conspicuous spindle-shaped stem galls, in which they overwinter, with adults emerging in spring (Gagné 1989). I noted several examples in different years throughout the course of this study. They were most easily located in winter, when formerly obscuring vegetation had died back. One old gall I dissected consisted of mostly solid pith interrupted by a narrow central chamber containing a spent cecidomyiid cocoon.
...
Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

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Campanula

[0111 - Calystegia]
I found the pale whitish larvae of this mordellid overwintering in dead stems of the host in winter, accompanied by brownish frass. The host plant was a convolvulaceous bindweed, tentatively identified as *Calystegia sepium.* I did not rear adults.
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[0112 - Calystegia]
Each larva of this borer appears to inhabit just a single leaf, tunneling out the interior of the petiole and sometimes part of the midrib as well. The walls of the tunnel have a noticeably ragged look to them. The leaf may wilt or shrivel and turn yellow or brown, betraying the presence of a larva at work in the leaf stalk. Some larvae prepare an exit shaft to near the surface of the petiole and pupate there, leaving the epidermis intact except for penetrating it with the anterior spiracles. The finding of other petioles with completed tunnels but no culprits present suggested that these leaves' larvae had exited the petioles and pupated externally, but this was not confirmed. I located the puparia formed in petioles during early- to mid-July.
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[0113 - Calystegia]
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...
Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

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[0114 - Campanula]
The larva of this species forms a shallow, externally visible mine in the stem of the host. In a photographed example, the mined tissue was yellowish in color, contrasting with the green color of unaffected stem tissue, and the mine contained broken lines of lumpy dark greenish frass. The tiny orange puparium was formed outside the mine. It appears that the puparium is the overwintering stage. The characteristics of the larval cephaloskeleton clearly place it in the subfamily Phytomyzinae, and after examining photos of life stages and plant damage, Eiseman (2018) suggested an identification of *Liriomyza* sp., referring to "a species of this genus already known to feed on *Campanula*"; Eiseman (2022) similarly lists this miner as a *Liriomyza*.
...

Eiseman, C.S. 2018. Comment on contributor post at BugGuide.net. Retrieved November 28, 2023 from [URL : https://bugguide.net/node/view/1569907 : end URL].

Eiseman, C.S. 2022. Leafminers of North America, 2nd edition. Self-published e-book. Available from the author at [URL : https://charleyeiseman.com/leafminers/ : end URL].

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[0115 - Campanula]
I found wasp larvae overwintering in dead stems of the host in December 2020. There was no clear external sign of the wasps' presence in the dead stems.

A typical affected stem contained several larvae lined up end-to-end in the hollow stem interior; between some of the larvae, there seemed to be partitions of unidentified material. Two of the examined stems were occupied by larvae from the base of the stem almost all the way up to the top.

I reared adults in April 2021 from the overwintered larvae. Additional stems located in the field in late May 2021 bore numerous neatly round exit holes, indicating successful emergence of the adult wasps sometime within the preceding several weeks.

One of the adults reared in 2021 was identified from photos as Eurytomidae by Hill (2021), and most of the other reared adults appeared superficially similar to this one. The family Eurytomidae contains species with a wide range of feeding strategies, including but not limited to phytophagy and entomophagy (Noyes 2004), and it was unclear which feeding strategies the adults from the 2021 rearing had practiced as larvae.

However, it seems likely a phytophagous eurytomid is involved here when one considers the similarities with a European species, *Eurytoma campanulae*, which has been reared from unblemished stems of *Campanula* and determined to be a plant feeder. Zerova and Klymenko (2017) reported that "the species [*Eurytoma*] *hypochoeridis* (Fig. 2.1; 2.2) was bred by us from the stems of several species of [bellflowers] (*Campanula*) inhabited by larvae of the herbivorous eurytoma - *Eurytoma campanulae* Zerova. ... [G]alls do not form on the stem at the feeding site [of the] *E. campanulae* larvae and the infected stem does not differ in appearance from a healthy stem" (p. 16, translated).

This was precisely the situation from which I reared the adults from *Campanula* in my study area. Furthermore, affected stems I scrutinized contained wasp larvae only, and if the wasps were all parasitoids of a stem feeder from a different order such as a cecidomyiid, there should have been evidence of a non-wasp host insect in at least one of the stems.

Eventual examination of reared adults by a specialist should help reveal how closely related this local feeder may or may not be to *E. campanulae* and/or *E. hypochoeridis*.
...
Hill, R. 2021. Comment on contributor page at BugGuide.net. Retrieved November 23, 2023 from [URL : https://bugguide.net/node/view/1960649 : end URL].

Noyes, J.S. 2004. Notes on families: Eurytomidae. In Universal Chalcidoidea Database. World Wide Web electronic publication. Retrieved November 23, 2023 from [URL : https://www.nhm.ac.uk/our-science/data/chalcidoids/eurytomidae.html : end URL].

Zerova, M. and S.I. Klymenko. 2017. New records about morphology and trophic associations of *Eurytoma hypochoeridis* (Hymenoptera, Chalcidoidea, Eurytomidae). Збірник праць Зоологічного музею [Zb. prac' Zool. muz. (Kiïv)], 48: 13–18, 2017. [*Note: the containing publication appears to be an annual proceedings from a zoological museum associated with the Ukrainian National Academy of Science's National Museum of Natural History in Kyiv. The paper was obtained from https://www.researchgate.net/publication/334429229_Zerova_MD_Klymenko_SI_NEW_RECORDS_ABOUT_MORPHOLOGY_AND_TROPHIC_ASSOCIATIONS_OF_EURYTOMA_HYPOCHOERIDIS_HYMENOPTERA_CHALCIDOIDEA_EURYTOMIDAE on November 23, 2023 and roughly translated using translation software.*]
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Campanulastrum

[0121 - Campanulastrum]
I found a larva overwintering in a lateral stem of a dead stalk of the host in January. During the same winter I also found a few other lateral stems that contained small amounts of whitish frass pellets accumulated near where the branches attached to the main stem. I tentatively identified these frass accumulations as the work of Mordellidae, but was not able to confirm this.

The January larva was fairly young, suggesting larvae may sometimes need to conduct significant feeding in spring (possibly in the main stem) before they reach maturity. Indeed, after I removed it from refrigeration at the end of winter, this larva consumed a significant amount of pith in a piece of host stem provided to it in a rearing container.

The apparent need to feed for a while in the dead stem during the spring of the larva's second growing season is similar to what I have seen in a few other mordellids. For example, the *Mordellistena* I reared from *Aquilegia* (record {0067}) followed this pattern, and I was even able to rear it to adulthood partly on a diet of *Campanulastrum* stem pith that I gave it when I ran out of the dead stem material of its original host.
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[0120 - Campanulastrum]
Larvae tunnel in growing shoots of the host, causing them to wilt conspicuously. I reared an adult in mid-July from a larva collected in late June. The adult appeared somewhat similar to those Hatfield (2022c) and I have both reared from fruits of the same host; one of Hatfield's adults was identified as *Paralobesia pallicircula* by M. Sabourin via dissection.
...
Hatfield, M.J. 2022c. Olethreutinae, Paralobesia pallicircula larva in pods of American Bellflower - *Paralobesia pallicircula* - Female. Contributor post on BugGuide.net. Retrieved January 28, 2026 from [URL : https://www.bugguide.net/node/view/2090153 : end URL].

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Cannabis

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Chaiturus

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Chamaecrista

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Chelone

[0143 - Chelone]
I found puparia of two types overwintering in the pith of dead stems. Both types were scalloped (not smooth) in outline. Puparia of the first type possessed posterior spiracular plates that were only lightly sclerotized, lacked any visible horns, and stood apart from one another by about four times their width. Puparia of the second type showed conspicuous horns on the posterior spiracular plates; I found these in elongate, rough-walled linear tunnels in the pith, typical of Agromyzidae. Adults, which appeared to belong to the genus *Phytomyza*, emerged from the second type of puparia in spring.
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[0144 - Chelone]
Larvae overwinter in dead stems and spin thin cocoons. The pupa is thrust through the wall of the stem upon the adult's emergence in spring. The moth is a beautiful maroon color, and K. Johnson tentatively identified it as Cochylini from photos (pers. comm.).

In the 20th century, M. Glenn reared *Cochylichroa viscana* from *C. glabra* in Illinois (Godfrey et al. 1987), and a quick review of images of that species on MPG (Moth Photographers Group 2026) shows a very strong resemblance to the adults I reared. Glenn's rearing of *C. viscana* was from "flowers and seeds" of turtlehead (ibid.), and my observations from the current study suggest a different species of *Cochylichroa* (as tentatively identified) on *Ageratina* may migrate from the flowers or fruits to the stems of that plant, or different individuals may inhabit either the reproductive parts or the stems of the plant (record {0028}) - so perhaps the same is true for *C. viscana* on *Chelone*.
...
Godfrey, G.L., Cashatt, E.D., and M. Glenn. 1987. Microlepidoptera from the Sandy Creek and Illinois River region: an annotated checklist of the suborders Dacnonypha, Monotrysia and Ditrysia (in part) (Insecta). Illinois Natural History Survey, Special Publication 7.

Moth Photographers Group. 2026. *Cochylichroa viscana* (Kearfott, 1907). Retrieved February 1, 2026 from [URL : https://mothphotographersgroup.msstate.edu/species.php?hodges=3783 : end URL].

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Chenopodium

[0145 - Chenopodium]
I reared adults from overwintered dead stems in spring 2017, and photographed larvae in stem pith of living stems in late August 2022. Larvae were pale yellowish grubs with a well-defined, darker head capsule, and are only tentatively placed here with the reared adults from 2017. The adults appeared similar to weevils reared by M. Palmer and identified as *Cosmobaris* sp. on BugGuide.net (Palmer 2018).
...
Palmer, M. 2018. Cosmobaris from Chenopodium sp. dead stems - *Cosmobaris scolopacea*. Contributor post on BugGuide.net. Retrieved January 9, 2026 from [URL : https://bugguide.net/node/view/1580405 : end URL].

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[0146 - Chenopodium]
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I located a stem mined by this insect in November, by which time the plant material was senenescing and the mine was vacant. The long, contorted, pale linear mine wound up and down the stem. I did not identify the host plant to species, but similar mines, all of them tentatively ascribed to *Marmara* sp., have been reported from *C. ambrosioides* (Feldman 2018), *C. murale*, and *C. standleyanum* (Eiseman et al. 2017).
...
Eiseman, C.S., Davis, D.R., Blyth, J.A., Wagner, D.L., Palmer, M.W., & T.S. Feldman. 2017. A new species of *Marmara* (Lepidoptera: Gracillariidae: Marmarinae), with an annotated list of known hostplants for the genus. Zootaxa 4337(2): 198-222.

Feldman, T.S. 2018. St. Andrews stem miner on Chenopodium ambrosioides SA1477 Marmara 2018 1. Contributor post on BugGuide.net. Retrieved January 9, 2026 from [URL : https://bugguide.net/node/view/1617271 : end URL].

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Cichorium

[0147 - Cichorium]
I found examples of this mine in 2020 and 2022. In the 2020 example, the mine was long, narrow, and whitish and meandered along the length of the stem. The base of an affected stem I found in November 2022 was heavily scarred by a vacant mine of this insect. A central frass line could be seen inside the mine when the outermost layer of stem tissue was scraped away. The placement to *Marmara* is tenatative.
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Cicuta

[0148 - Cicuta]
I collected an active mine of this fly in a basal leaf petiole of the host growing in a wetland in mid-June. The egg-laying scar was visible in the epidermis in the distal portion of the petiole, where the mine originated. The larva mined in one direction from the oviposition site for several centimeters, then reversed direction and mined the opposite way. Eventually it ended up in the proximal half of the petiole, where it formed its puparium just under the petiole epidermis, about 60mm from the petiole base. The puparium was formed by June 22 and the small, black adult fly emerged on 6 July.
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Circaea

[0149 - Circaea]
I reared adults of this borer from multiple overwintered dead stems of the host in spring 2021. The larva is yellow with a orangish-brown head capsule featuring a small dark spot in the ocellar area; also, my photos indistinctly show a lightly sclerotized area on the posterior end of the larva similar in color to the head capsule. The larva tunnels in the
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lower stem, producing dry granular pellets of frass, and pupates there in a white, finely woven cocoon. The anterior end of the cocoon connects to an operculum in the wall of the stem, through which the adult moth emerges, leaving the pupal exuviae behind in the cocoon.

In addition to these observations involving lower stems, I have found several upper stems of the host each containing a small hole opening into a short tunnel in the stem interior. In one case a 15mm-long stretch of tunnel adjacent to the hole was filled with compacted frass. In another case, the tunnel began as a whitish, externally visible linear mine, then proceeded deeper into the stem interior, where I found a head capsule, apparently lepidopteran, about 15mm from the entrance hole. In a third case the tunnel began about 6/10ths of the way up the stem, and moved downward approximately 35-40mm, with darkish brown frass scattered throughout, then seemed to end in a slightly enlarged, vacant chamber. Although it is not at all clear whether these tunnels were all made by the same type of insect, I suggest that at least some of these examples may represent the work of early-instar *M. luciferella*, tunneling in a limited area of the upper stem before relocating to the lower stem to complete the bulk of its feeding activity.
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[0784 - Circaea]
Two examples of this mystery sign, only tentatively identified as the work of an insect, presented themselves to me in 2021 and 2025. In each case a limited region of the middle to upper portion of the stem had discolored from green to brown. In the 2025 example, a single, tiny hole could be seen in the center of the discolored area. Photos show the epidermis displaced outward (i.e. away from the stem) along the edges of this hole, suggesting the emergence of a very small insect from inside the stem. I have observed somewhat similar discoloration and holes to be the work of cecidomyiids in stems of other hosts, and that is my best guess for what could be responsible for this sign. I dissected the 2025 example but found nothing in the pith near the hole. Further study is needed.
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Cirsium

[0151 - Cirsium]
I collected a larva in the pith of an overwintered dead stem in late May. It formed a pupa by June 15 and the adult eclosed before June 24, when I opened its stem piece and found it still inside its pupation chamber in the pith. The larva and pupa were a pale whitish color.
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[0152 - Cirsium]
I found multiple puparia in heavily tunneled pith at the base of a dead stalk of a native *Cirsium* sp. thistle in January. Photos show one of the puparia had fairly strong black horns on the black posterior spiracular plates, which were separated by approximately their own width. A female adult, identified as *Melanagromyza* by O. Lonsdale (O. Lonsdale and C. Eiseman, pers. comm.), emerged from one of the puparia in spring.
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[0155 - Cirsium]
Stem-boring larva was collected on June 7 and adult emerged September 12; reared on carrot. Adult identified from photos by A. Brees and M. Kenne (pers. comm.).

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[0156 - Cirsium]
On June 3, I collected several pupae of this borer in an affected shoot of the host. The tip of the shoot was necrotic and filled with wet black frass, with the pupae in a hollowed-out area within or just below the agglomeration of frass. Adults emerged on June 12. I identified them tentatively as *P. carduidactylus*, based on visual similarity to photos on BugGuide.net, along with Hatfield's (2017) rearing of confirmed *P. carduidactylus* from thistle in the same county where I found my pupae.
...
Hatfield, M.J. 2017. Pterophoridae, larva - *Platyptilia carduidactylus*. Contributor post on BugGuide.net. Retrieved January 10, 2026 from [URL : https://bugguide.net/node/view/1465383 : end URL].

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[0157 - Cirsium]
Affected overwintering rosettes of the host showed narrow, blackened, linear tunnels in their petioles, apparently originating in the crown or roots. In areas where a tunnel strayed near the upper epidermis of the petiole, it was faintly visible externally. My photos show a neatly cut oval exit hole in the upper surface of one tunneled petiole, leading directly from the interior tunnel to the outside world. The exit hole appeared to include tattered remnants of a thin operculum that had ruptured when the insect emerged. The overall appearance of the tunnels and the exit hole and operculum suggested Diptera to me, but I was unable to locate the culprit to confirm this guess.
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[0154 - Cirsium]
I found several mines of this insect in petioles of rosette leaves in September and October. In a typical petiole, the mine was narrow and whitish toward the distal end of the petiole, widening toward the proximal end of the petiole where it also tended to turn brown, and where a thin central frass line could sometimes be discerned. In one mine, near the base of the petiole, I found and photographed an apparent gracillariid head capsule. The identification to *Marmara* sp. is based on this head capsule along with the general appearance of the mines.
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[0153 - Cirsium]
I collected an occupied, midrib-centered leaf mine of this species on June 19, 2018. The mature larva emerged from its mine and spun a cocoon on the leaf underside, and the adult moth emerged on July 10. I also observed leaf mines of this species in a native *Cirsium* sp. and in Canada thistle (*C. arvense*) in a garden in 2024. In these mines, backlighting the leaf revealed hollowed-out and partially frass-filled areas in the interior of the midrib, from which short linear or linear-blotch portions of the mine radiated out into the leaf blade. Identification based on Eiseman (2022).
...
Eiseman, C.S. 2022. Leafminers of North America, 2nd edition. Self-published e-book. Available from the author at [URL : https://charleyeiseman.com/leafminers/ : end URL].

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[0150 - Cirsium]
In February, I found four cecidomyiid larvae overwintering in the pith of a partially hollow dead stem. Two of these larvae were at least partially embedded in the pith layer, while a third was deeply embedded, and a fourth dwelled more on the surface of the pith layer within
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the airy stem interior. The larvae were an orange or orange-pink color, and photos show at least two of them had a pair of recurved lobes on the terminal segment, as reported for the genus *Resseliella* in Gagné (1989).
...
Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

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[0743 - Cirsium]
In late June, I found a single spherical stem gall of this insect, not yet fully developed. Later, in late July at the same location, I observed two larvae in side-by-side ovoid chambers in the interior of a second gall. The two larval chambers were mostly smooth-walled, with photos showing a narrow tunnel curving upward through the pith of the gall from one of the chambers. Larvae were squat, plump, and pale yellowish-white.
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Claytonia

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Clematis

[0159 - Clematis]
The pale yellow larva of this borer forms an elongate tunnel in the pith of the stem. Rather than concentrating its feeding in a localized area within the stem (as does another internally feeding agromyzid on *Clematis*, in record {0158}), it travels for a long distance along the main axis of the stem until it completes its development, its tunnel usually spanning multiple internodes.

The tunnel has ragged walls typical of agromyzid borers, and my photos show small liquidy splotches of dark green frass deposited periodically along the length of a tunnel. In one case I also observed the remnants of a larva's cephaloskeleton left behind in its tunnel after a molt. The rear portion of the cephaloskeleton appeared as if divided in two robust arms, suggesting the species belonged to the subfamily Phytomyzinae, which I was later able to confirm with successful rearing. My photos also show that the posterior spiracles of one larva each featured orangish-brown bulbs arranged in a ring and slightly elevated above the surrounding tissue, with the pale center of the ring apparently lacking any bulbs or discernable darkening.

When it is finished feeding, usually somewhere along the length of an internode, the larva establishes a short, curving tunnel outward to just under the bark of the stem. It cuts an exit slit or window in the bark that remains closed for the time being. The larva then pupates here at the terminus of the curved tunnel, the puparium taking on the arching shape of the tunnel in a manner unusual among the stem agromyzids examined in the current study.

Also unusual for a stem agromyzid, the anterior end of the puparium is modified into a peculiar, flat, circular "lid" that remains appressed to the underside of the bark until the adult emerges, at which point the "lid" (along with the exit window in the bark) pops open. The slender, teardrop-shaped anterior spiracles of the puparium arise from the main body of the puparium, projecting from the rim where the "lid" attaches. Aside from the unusual curved shape and modified front end, the puparium possesses unremarkable posterior spiracles

that appear to be rather weakly sclerotized, without development of strongly darkened plates or significant horns, although the plates are darker in color than the surrounding integument. Overall the puparium is a whitish color.

I reared a single male adult in spring 2023.
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[0158 - Clematis]
The larva tunnels in a current-year stem for a short distance (roughly 10-20mm) through the pith immediately adjacent to a node, then spends the rest of its time feeding in the node, causing extensive hollowing in this highly localized area. Dissecting an affected node reveals that the hollowed-out chamber inside is distinctly and strongly blackened. Externally, an affected node may discolor slightly but otherwise there seems to be little outward sign of the borer's presence, unless the larva has finished feeding and vacated the node, in which case an exit hole may be visible.

The only puparium I have so far obtained was formed outside the stem, by a larva that emerged from plant material collected on October 11, 2023, after the plant material was held indoors for three days. I did not observe the larva emerging from the stem, but after I found the puparium in the rearing bag, examination of the stem revealed an exit hole in one affected node that appeared freshly made. There was also a single leaf mine in the plant material, but the old age and small size of the leaf mine, along with the apparent absence of an exit slit in the leaf epidermis, strongly suggested the puparium did not come from the leaf.

Details of the puparium also match larvae I collected in 2022 from inside "black hole" chambers in stem nodes. These larvae were all significantly immature despite having been collected over the course of three months from midsummer to late summer, on July 9, July 20, August 16, and September 6, suggesting that larvae typically do not reach maturity until late September or early October -- a good match for the timing of the puparium from the 2023 October 11 collection. It is conceivable that some larvae could overwinter in the stems and emerge the following spring, but thus far, in the current study, no such overwintering larvae have been found.

I reared an adult female from the 11 October 2023 puparium the following spring.

This local feeder/borer should not be confused with the agromyzid borer in the same host that tunnels for relatively long distances through the stem, primarily in the internodes, and pupates internally (see record {0159}).
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Conyza

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Coreopsis

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Cornus

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Corylus

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Cryptotaenia

[0801 - Cryptotaenia]
I have consistently found *Forcipomyia* larvae in association with *Cryptotaenia*. They may be found in the senescent stems of this plant in October and November, where some of them appear to overwinter. Often they are accompanied by a significant amount of clumpy, moist, dark brown frass along with obvious signs of feeding damage on the remnants of pith lining the inner walls of the stem. It has usually been my impression that at least some of this frass and damage was generated by the forcipomyias, but at this writing I cannot rule out the possibility that another insect, no longer present in the stems, collaborated with them in the internal feeding. The boundary between herbivory and saprophagy here is also unclear, as I have not yet been able to discern the extent to which the host stems are alive when larvae first begin their feeding. True herbivory has not been recorded in *Forcipomyia* as far as I know.

I include this record in the survey because of the persistence and predictability of the association with *Cryptotaenia*, which suggests an intentional choice on the part of the insect year after year and represents a fascinating ecological interaction. Of the several hundred species of herbaceous plants whose dead stems I have examined in search of insect life in my study area, I do not recall finding *Forcipomyia* larvae in any plant other than *Cryptotaenia* -- and yet they show up in this plant again and again, in at least four different sites across multiple years in my local area alone.

The larvae are also unique among stem-dwelling insects. They are elongate with a single pair of "prolegs" on the front of the thorax (officially known as a "prothoracic pseudopod"; see, e.g., Saunders (1924)), an ovoid head capsule with distinctive darker markings, and long setae to which milky or transparent drops of exudate often adhere. The function of the exudate appears to be defensive (see below).

I collected several larvae in early- to mid-October, 2021, and captured photographs as well as this video of a larva crawling ((https://www.youtube.com/watch?v=2LpdkcbprMM). The larvae were easy to sustain on senescent stems of *Cryptotaenia* kept hydrated in a suitably (but not overly) humid vial, as long as there was some soft organic matter remaining in the stem interiors on which they could graze. When done feeding they pupated in the stem or on paper toweling provided in the rearing container. The molted exoskeleton of the final-instar larva enshrouds the rear part of the pupa. Adults emerged in early November.

The seasonality of larvae and adults of *Forcipomyia* has been the subject of some discussion, with authors sometimes expressing confusion or a lack of understanding about the question of summer generations. As Bystrak and Messersmith (1980) explain (p. 115):

"Apparently either the adults or the eggs [of *Forcipomyia pinicola*] or some combination thereof oversummers, but the exact situation has not been determined. Larvae have not been found between 2 April and 22 October. In the same area, adults have been collected only between 15 April and 17 October. Although other species in this subgenus have two or more

generations per year, we have been unable to locate a summer generation in this one. We could find winter larval sites with little effort, but were never able to locate summer sites even though we spent more time and effort at it. Saunders (1924), in speaking of *F. radicola*, suggests that some species may exhibit a summer ecology that is totally different from the winter one in order to explain his consistent inability to locate them. A more logical explanation is that summer generations do not occur."

Regarding the droplets of liquid on the larvae, these have apparently been studied in some detail for at least some species in the genus. Wirth and Grogan (1978) provide a summary of these findings by several authors, including the fact that the droplet-bearing setae apparently have a cavity inside that is connected to a greatly enlarged subdermal cell, and it is these enlarged cells that produce and/or regulate the production of the drops (Frew 1923). It has also been shown that the droplets can help protect the immature stages from predators, as Wirth and Grogan (ibid., pp. 100-101) relate in the following description of an experiment by Hinton (1955):

"Using a laboratory colony of the ant *Lasius niger* L., [Hinton and his students] found that the ants would attempt to attack larvae of *Forcipomyia (F.) nigra* (Winnertz) when the latter were placed within their enclosure. Usually, whenever the ants came close enough to bite the midge larvae, they touched one or more droplets of liquid on the hastate setae, at which time they immediately dropped the larvae and usually spent several minutes cleaning themselves. Experiments at different relative humidities showed that at low humidities, when droplets were not formed, larvae were dropped less quickly by the ants than at high humidities when the setae had large drops on their apices. If the last larval skins were removed from midge pupae, the ants would carry the pupae to their nest; they also succeeded in carrying away pupae if they could attack them from the front and dislodge them from the larval cuticle. But if the ants approached the pupae from the side or rear, they always became smeared with the hygroscopic substance remaining on the larval cuticle and would retire and clean themselves. When the midge pupae form their usually complete circular aggregations, they form nearly a perfect defensive barrier against such attacks by predators. The chemical nature and mode of action of the hygroscopic substance remain a mystery."

My cursory review of the literature did not turn up previous records of *Forcipomyia* from stems of wild herbs, but the larvae have apparently been collected from inside "rotting stalks of potato plants in a rubbish heap" (Lavigne 1961, referring to a report from Saunders (1924)).

Lastly, a personal note: I find the larvae delightful and the adults are also unusual. Appearing in my life for the first time as they did around Halloween, their flame of quirky essence burned steadily and convivially amid the rogue's gallery of spooky, fantastic, and whimsical creatures and overall climate of mystery that mark the season. In an astonishing look at *Forcipomyia*'s role in the "rogue's gallery" of Animalia, Murray (2026) provides an excellent illustrated account of *Forcipomyia* larvae from around the world, including individuals with ornate and bizarre "balloons" of exudate. Some of these spectacular larvae have apparently not yet been reared in order to associate them with their adult form.

...
Bystrak, P.G. and D.H. Messersmith. 1980. A new species of midge of the genus *Forcipomyia* Meigen (Diptera: Ceratopogonidae) from North America. Proceedings of the Entomological Society of Washington 82(1): 108-116.

Frew, J.G.H. 1923. On the larval and pupal stages of *Forcipomyia piceus* Winn. Annals of Applied Biology 10: 409-441.

Hinton, H.E. 1955. Protective devices of endopterygote pupae. Transactions of the Society for British Entomology 12: 49-92.

Lavigne, R.J. 1961. Occurrence of *Forcipomyia ciliata* (Winnertz) in North America with notes on its biology (Diptera: Ceratopogonidae). The Pan-Pacific Entomologist 37(2): 108-110.

Murray, A. 2026. The biting midge larvae of *Forcipomyia*. In "A Chaos of Delight* [website]. Retrieved February 3, 2026 from [URL : https://www.chaosofdelight.org/forcipomyia : end URL].

Saunders, L.G. 1924. On the life history and the anatomy of the early stages of *Forcipomyia* (Diptera, Nemat., Ceratopogoninae). Parasitology 16(2): 164-213.

Wirth, W.W. and W.L. Grogan Jr. 1978. Notes on the systematics and biology of the biting midge, *Forcipomyia elegantula* Malloch (Diptera: Ceratopogonidae). Proceedings of the Entomological Society of Washington 80(1): 94-102.

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Cucurbita

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Cuscuta

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Dactylis

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Daucus

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Desmodium

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Dichanthelium

[0198 - Dichanthelium]
I found a plant with a browned, shriveled shoot tip in late May; the interior of the stem had been heavily tunneled and converted to dry frass. The damage was similar to Lepidoptera activity seen in other grasses in this study, but the culprit was absent, so I was unable to confirm its identity.
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Diervilla

[0200 - Diervilla]
I discovered two larvae under the bark of a stem in early spring. They had evidently overwintered in the twig.

Each larva dwelled in a narrow, blackened chamber, roughly 10-12mm long and 2mm wide, sunken shallowly into the green tissue under the bark. In both cases observed, the chamber sat at the end of a long, thin line, reminiscent of a tunnel, running for some 40-60mm along the length of the stem, also in the uppermost layer of the green tissue and darkened similarly to the chamber. Both line and chamber were externally invisible unless the bark had been peeled away. It appeared possible that the line represented a path across which the larva had migrated through the stem tissue before settling in the terminal chamber, but this could not be confirmed.

A larva I observed up close was bright orange in color, with a narrow reddish spatula having two prominent outer teeth and a much shorter, third inner tooth between them.

Neolasioptera caulicola (Felt) has been previously reared from larvae living cryptically under bark of this host (Gagné 1989).
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Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

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Dioscorea

[0201 - Dioscorea]
In early October, 2022, I located a parasitoid larva in a hollow in the base of a leaf petiole of the host. The chamber's walls had blackened in a manner typical of *Neolasioptera*, and the remains of a second, orangish larva accompanying the parasitoid appeared initially consistent with Cecidomyiidae, but with closer inspection I was unable to locate a spatula on the larval remains. An undetermined species of *Neolasioptera* has been previously reported from petioles of wild yam (Gagné 1989).
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Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

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Dodecatheon

[0202 - Dodecatheon]
I came upon several flower stalks affected by this borer in late May. The stalks were noticeably wilted, and photos of one show a small frass expulsion hole in the stem just below the crook where the plant was doubled over. Inside, the stem had been hollowed out and a *Papaipema* larva was present in the tunnel.
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Echinacea

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Echinocystis

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Elymus

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Enemion

[0212 - Enemion]
In early May I located a wilting rue anemone amid a sea of blooming ephemerals. The plant had drooped over and a single round hole was visible in the middle to upper part of the stem. Inside the stem had been hollowed and a *Papaipema* larva was present. I reared it to middle age, at which point it did not possess any clearly visible white stripes on the first four abdominal segments.
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Equisetum

[0213 - Equisetum]
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I came upon a horsetail shoot with a necrotic terminal portion in late May. Inside, the walls of the stem interior had darkened and there was what appeared to be a limited accumulation of wet black frass. A Lepidoptera larva dwelled in the affected area of the stem. It was banded reddish-brown and white with a darker head capsule and prothoracic shield, at least somewhat similar to a young *Papaipema* larva, but I was unable to confirm the identification.
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Erechtites

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Erigeron

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Eryngium

[0221 - Eryngium]
I found an inviable puparium overwintering in a tunnel in a dead stem of the host in February 2022. The puparium was straw-colored, with darkened posterior spiracle plates separated by a little less than their width and each bearing a robust, curved black horn about as long as the plate was wide. The shape of the horns and separation of the plates were somewhat similar to those of an apparent *Melanagromyza* species I have reared from *Zizia* (record {0615}).
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Euonymus

[0716 - Euonymus]
While walking with a friend and colleague in a rich woods in mid-May, we came upon herbivory and small caterpillars on eastern wahoo. Several young shoots of the affected plant had wilted. Close examination revealed exit holes and frass at the bases of the wilted areas. I dissected one shoot above the exit hole and found that a region of the green stem about 10mm in length had been tunneled out and loosely filled with whitish frass, with the culprit absent. Nearby on the same shrub, a few shoot tips had been woven together with silk to make leaf shelters. One of these shelters, when opened, contained multiple pale tan or yellowish microlepidoptera larvae. Given the very small diameter of the tunneled shoots and the proximity of the leaf shelters, I guessed that the shoot borer larvae had exited the shoots to feed gregariously in the leaf shelters -- so that both forms of herbivory were done by the same insect -- but I was unable to confirm this.

Yponomeuta multipunctella has been reported feeding externally on *Euonymus* in Illinois (Harrison 2026), and T. Harrison agreed that the larvae I had found were possibly something in *Yponomeuta* after I shared photos with him (pers. comm., May 2025).
...
Harrison, T. 2026. Family Yponomeutidae. On Microleps.org [website]. Retrieved January 27, 2026 from [URL : http://www.microleps.org/Guide/Yponomeutidae/index.html : end URL].

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Eupatorium

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Euphorbia

[0226 - Euphorbia]
In mid-January 2022, I found multiple gall midge larvae inside blackened pith at the very base of a dead stem of flowering spurge. A larva I photographed was pale yellow, with a reddish spatula strongly bifurcated anteriorly into two robust triangular teeth.
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Eutrochium

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Fallopia

[0237 - Fallopia]
A young larva of this combined internal and external feeder that I photographed in its stem was solid orange in color on its head, thorax, and first two or so abdominal segments, with the rest of the abdomen striped yellow and white. Older larvae retained similar patterning but the yellow and orange regions of the integument darkened to black.

During winter and early spring, the larvae of this moth may sometimes be found in dead stems of the host within 20mm of a node or branching point of the stem.

In some cases larvae had evidently traveled a significant distance (up to maybe 20-25 cm) through the hollow stems, judging by the sparse, often dark frass left behind and by the fact that along these lengths the small amount of solid pith at the nodes or branching points of the stem had been tunneled through.

When searching for larvae, I would follow the sparse frass to a node, wondering if the larva was there, and then note that a tunnel passed through the node and frass was present on the other side of the node as well, so I would pass by the node and continue following the sparse frass along the length of the stem. I sometimes correctly guessed I had found a larva

when I approached a node from both ends, and if the stem on one side of the node had sparse frass but the stem on the other side was clean, I concluded that the larva had stopped tunneling at that node and was dwelling by that node.

In at least one case I noticed what appeared to be a tunnel at a node leading from the leaf scar into the stem hollow in which sparse frass revealed a larva had been present. This suggested to me that perhaps this larva had started feeding in the petiole of a leaf and then tunneled into the stem from there.

A few of the dead stems I opened in winter appeared to have exit windows cut in the pith. It was hard to know with certainty that they were exit windows since some inhabited stem lengths had 2 or 3 small pits cut in the pith and it wasn't clear if these were feeding pits, several attempts at an exit window, or something else. I did backlight two or three such pits that looked especially like exit windows and one could indeed see light shining through.

However, despite extensive searching from 2022-2023 I found only a few individuals in the stems; it was impressive how many stems I checked were unoccupied.

A rearing attempt revealed that larvae who overwintered in the dead stems emerge in spring and then must feed on fresh foliage of the host to complete their development. It follows that, in nature, they must travel a significant distance to get to their spring food supply, since the dead stems are often twined around trees and shrubs well aboveground.

In a rearing container, a typical larva folded over a portion of a leaf and tied the fold with silk, then hung out inside the fold, from which it fed on the margins and eventually the full extent of the folded area. I recorded the following observations about one of these larvae I refer to as individual C:

"[When a larva had emerged from its dead stem piece in the spring after overwintering,] I put a small, fresh *Fallopia scandens* leaf in [the rearing container]...Within minutes, the larva became active and wandered onto the leaf.

"It explored the leaf blade for a brief bit, then went to the petiole and followed the petiole down to its cut off end [which I had cut to fit the leaf in the container], where it paused for maybe a minute with its head on the cut end and I couldn't see what it was doing.

"Then it went back onto the leaf blade and proceeded to hone in on one particular area of the leaf, an area where the edge was bent up, resulting in a natural concavity to the upper leaf surface. This was just like the area that individual A settled on and in which it folded over the edge with silk to make a tight fold.

"Individual C then ate out a short, ~8mm long and ~1mm wide feeding [track] from the edge of the leaf. It wandered about in the concavity for a few seconds, apparently laying down some silk lines from one side of the concavity to the other (as if to begin drawing the sides together into a fold, as individual A had done), then proceeded to the petiole again.

"This time, instead of traveling [all the way] down the petiole, it stopped with its head about 4 mm down the petiole from the edge of the leaf blade. Here it began to cut a notch in the petiole! I watched it do so, then stopped watching and came back later. Upon coming back later I found that the notch was clearly visible on the dorsal (upper) surface of the petiole, cutting [through] maybe one-third of the diameter of the petiole and covering a surface area of maybe 1.5 square millimeters. The larva had since moved back to the concavity, where the edge of the leaf had begun to fold over noticeably thanks to the larva's silking; the larva had also eaten out an area of maybe three or four additional square millimeters (in the same spot where it had incised the initial 8mm x 1mm feeding line) and was continuing to lay down silk fastening lines."

At least two fully fed larvae then returned to the hollow dead stems still present in their rearing containers, in which they spun cocoons for pupation. A third larva spun a thin silk

mat between a leaf and the side of the rearing container, then produced a parasitoid wasp larva.

Unfortunately the larvae that spun cocoons in stems after feeding externally on leaves also all succumbed to parasitism, with a single wasp emerging from each of their cocoons.

The damage to stem interiors I observed was fairly limited compared to the extensive external feeding on leaves in rearing containers during spring. Even larvae that traveled extensively within the long linear dead stems during winter produced only small quantities of frass, without excavating large areas of pith. Given this fact, along with the relative scarcity of the stem-dwelling larvae and the fact they all produced parasitoid wasps, leads me to wonder if stems are usually only colonized by parasitized larvae, with healthy larvae perhaps completing their development entirely within leaf shelters.
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Festuca

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Gentiana

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Geranium

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Geum

[0254 - Geum]
- Mines and puparia found in petioles of basal leaves, avens, *Geum* sp. (probably G. canadense)
- My photographs show two affected basal leaves, each with a puparium under the epidermis near the base of the petiole
- The mining in each petiole was confined to the area near the base of the petiole and did not appear to be anywhere near extensive enough to account for all the mining that each larva would have needed to complete in order to reach the puparium stage
- Thus, I assumed that the majority of the mining actually took place in the crown of the plant or in the roots
- When pupating, each larva projected its two long-stalked, black anterior spiracles through the petiole epidermis at approximate right angles to one another
- Apparently intact puparia were found in October, suggesting the puparium is the overwintering stage
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Helenium

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Helianthus
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Impatiens

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Juniperus

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Lactuca

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Laportea

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Lapsana

[0306 - Lapsana]
The larva tunnels in the layer of pith lining the interior of the hollow stem. Pupation occurs in the pith, with an exit window prepared nearby in the outer wall of the stem, and in at least some cases the puparium is evidently the overwintering stage. The insect is tentatively identified as *Melanagromyza* sp. based on the color, shape, location, and posterior spiracles of the puparium.
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Leersia

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Leonurus

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Lepidium

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Leucanthemum

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Lespedeza

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Lobelia

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Lupinus

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Lycopodium

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Lycopus

[0322, 0637 - Lycopus]
In the current study, I initially found mines in leaves and stems of *L. americanus* and in stems of *L. uniflorus* in September and October, 2021-2023. Following Eiseman (2022), and given that *Pseudopostega auritella* has been confirmed to use *Lycopus* as a host in Europe (van Nieukerken 1989; van Nieukerken 2024), I assumed that these mines were the work of an opostegid moth in the genus *Pseudopostega*, but the mines were empty when found.

In 2024, colleague T. Feldman located mines in North Carolina in mid-July (Feldman 2024). This helped prompt a renewed search in the Upper Midwest as part of the current study, and in late July, I discovered and photographed a young larva in *L. uniflorus*. It was located in an interior mine in the pithy tissue lining the inner wall of the lower stem; this part of the mine was not externally visible, but higher on the plant, the mine strayed into shallower tissues and could be seen from the outside.

Also in the current study during July 2024, I located the oviposition sites on three affected plants of *L. americanus* and one affected plant of *L. uniflorus*. In all four examples the egg had been laid on the underside of a leaf on the middle to lower part of the plant. In every case, upon hatching, the larva had formed a short linear mine in the leaf blade before entering the leaf midrib or petiole. In one instance some of the eggshell remained; in each of the other three instances the eggshell was mostly gone, but there was a linear accumulation of black material reminiscent of frass. The material appeared to trace the former outline of the eggshell and then lead into the mine. Ellis (2001-2024) reports that in freshly hatched *Stigmella* (Nepticulidae), "the emerging larvae, at the point of begining its mine, vacates its gut into the empty egg shell." If the same procedure is followed by larvae of the *Lycopus* *Pseudopostega*, that would explain the presence of the black material leading around the eggshell and then into the mine.

Nearly all observed stem mines on both *L. americanus* and *L. uniflorus* appeared to lead down to ground level. All the way to ground level, the stem mines also appeared too narrow to have been produced by mature opostegid larvae. Thus, the evidence suggested that, as with some other opostegids documented in the current study, larvae of the *Lycopus* feeder may spend time feeding in the belowground parts of the plant.

I observed tunnels in an overwintered *L. americanus* rhizome collected in late May, but the culprit had already abandoned the plant material, and so I could not confirm that the damage was the work of an opostegid. It is not known if larvae typically finish feeding in the belowground parts, or move up into new shoots in spring or summer as is documented in this study for opostegids in *Monarda*, *Blephilia*, and *Mentha*.

Update, 2024: colleague C. Eiseman shared the following account with me (pers. comm., 27 July 2024): "I found several [opostegid] mines yesterday [26 July 2024] on ~20 cm tall *L. uniflorus* plants in more or less full sun, in a shrub swamp in the southwest corner of Massachusetts. I collected three mined plants and just finished examining them. In each case the mine is 2-4 cm from the top of the plant, and each eggshell is on the underside of the leaf as John observed, at (or very close to) the leaf margin. One mine has exited the leaf and in transmitted light is visible going up the stem; it will have to turn around soon since there is only 2 cm of stem above the mined leaf. The other two larvae are still in the leaves--not clearly visible in transmitted light, but it is clear that the mine ends inside the leaf (even though one of them meandered to the very base of the leaf blade at one point)." Also, E. van Nieukerken examined the photos of the opostegid eggshells in this document and commented that "[they] look very much like those of nepticulids, as could be expected" due to the affinity of the two families (pers. comm., 20 July 2024).

Update, 2025: On June 10th, after visually examining the exteriors of approximately 60-75 *L. americanus* shoots, I found three that contained subtle raised areas in the lower stems, a result of opostegid internal feeding. Two of these shoots also contained semicircular exit slits, indicating the larvae had already abandoned them. One of the slits appeared very fresh, as if it had been made within the last 1 to 3 days, while the other slit

appeared significantly older, made perhaps a week ago or even further in the past. Larvae had tunneled somewhat shallowly in the stems, accounting for the externally visible raised areas. They had also clearly fed in deeper tissues; in the two stems bearing exit slits, the lowermost 20-40mm of each stem contained a tunnel in the center of the stem interior, with a short passageway leading from this tunnel out through the exit slit. The larva's tunnel system was also visible in the cross section of the bottom end of the shoot (the location where I had cut the shoot from the rhizome), suggesting the larva had migrated from the rhizome into the shoot.

Special Note: Thank you to C. Eiseman and E. van Nieukerken for contributing the comments quoted in the text, and to T. Feldman for sharing his observation of early mines in mid-July which helped lead to some of my summertime observations shown on this page.
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Eiseman, C.S. 2022. Leafminers of North America, 2nd edition. Self-published e-book. Available from the author at [URL : https://charleyeiseman.com/leafminers/ : end URL].

Ellis, W.N. 2001-2024. Egg. In Plant parasites of Europe: leafminers, galls and fungi. Retrieved July 27, 2024 from [URL : https://bladmineerders.nl/introduction/mines/life-stages/egg/ : end URL].

Feldman, T.S. 2024. Contributor post at iNaturalist.org. Retrieved July 27, 2024 from [URL : https://www.inaturalist.org/observations/230219591 : end URL].

Nieukerken, E.J. van. 1989. Opostegidae. Pages 357-372 in Johansson, R., et al. The Nepticulidae and Opostegidae (Lepidoptera) of North West Europe. Fauna entomologica scandinavica 23:1-739.

Nieukerken, E.J. van. 2024. Biology of *Pseudopostega* species in Europe (Lepidoptera: Opostegidae). In van der Linden, J. 2024. Some endophagous insects from the Upper Midwest, USA. Self-published Web reference. Retrieved July 27, 2024 from [URL : https://insect-pages.github.io : end URL].

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Maianthemum

[0324 - Maianthemum]
The larva of this borer tunnels in the late-season, senescing stem of the host, finishing up and pupating near frost (one individual I observed was still a larva as of October 3, and by October 16 it had finally formed its puparium).

I reared adults in spring 2022 from overwintered puparia.

The host is a *Maianthemum* that has not yet been identified to species, either *M. racemosum* or *M. stellatum*. Species-level identification of the fly is courtesy B. Sinclair (pers. comm., via C. Eiseman, January 2024).

This fly is one of my favorite stem-boring insects.
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[0325 - Maianthemum]
The upper portion of a dead stem of the host that I examined in winter 2022 contained two tiny, oval holes in its exterior. Dissecting the stem at this point revealed a white cocoon at each hole, with the anterior end of the cocoon opening directly through the hole. I did not observe any larvae, pupae, or adults directly, but the shape, color, size, and texture

of the cocoons, along with the faint blackening of the stem interior tissue adjacent to them and even on one of their surfaces, were all strongly suggestive of a cecidomyiid. Given that the cocoons were empty in winter, the adults must have emerged during the same growing season in which they grew to maturity as larvae.
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Melilotus

[0753 - Melilotus]
On opening a stem of the host in early August, I found tunneling in the interior along with the culprit. My photos show the individual had reached the pupa stage by August 7, and the adult stage by August 20, when I found it successfully eclosed and hardened but still inside its pupation chamber in the stem piece in the rearing container. The pupa was a more or less uniform, rich orange color, and the adult resembled *L. mozardi* in overall color pattern (dorsal and ventral) as well as in its choice of host (see, e.g, Bartlett et al. 2025), but the identification was not confirmed by a closer morphological look.
...
Bartlett, T., Moisset, B., Quinn, M., and V. Belov. 2025. Species *Languria mozardi* - Clover Stem Borer. Species info page at BugGuide.net. Retrieved January 26, 2026 from [URL : https://www.bugguide.net/node/view/3075 : end URL].

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Menispermum

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Mentha

[0639 - Mentha]
Externally visible linear mines were found in several stems of the hostplant in a wetland in October 2023. The mines traversed the lengths of multiple internodes, crossing the nodes to get from one internode to the next. Often, most of the length of a mine in a given internode showed little or no solid frass accumulation (but some smudgy areas suggesting solidified liquid frass); then, as the mine neared an adjacent node, there would be a sudden deposition of a small to moderate amount of frass in a 1-3mm section of the mine. As with similar mining formed by an opostegid during summer and fall on aerial stems of *Monarda fistulosa* (record {0339}), these mines seemed too narrow to have been created by mature larvae, and all observed examples led down to ground level, where they disappeared into the belowground parts of the plant.

On 26 May 2024, a spring shoot of the hostplant at the same site was found to contain a slightly swollen and discolored area in the base of the stem. The appearance and timing of the damage was essentially identical to damage accomplished by nearly mature opostegid larvae in other hostplants in the study area. By 1 June the opostegid larva in this stem had left the interior of the swollen and discolored area and mined upward, forming a short, shallow, subepidermal linear mine. In contrast to the narrowness of the mines formed by young larvae in mature stems of the host in the summer or fall, this brief terminal mine was

relatively wide, reflecting the large size of the larva. By 3pm the next day, the larva had finished its feeding in this short mine and was lying motionless in the mine right behind the rounded terminus of the mine, with what appeared to be a partial exit slit cut in the stem epidermis. By 6pm the same day, the larva had exited the stem and was spinning its cocoon in the tissue paper at the bottom of the rearing container. Upon evacuating the stem, the larva left behind a ragged, semicircular exit slit at the endpoint of the mine.

The disappearance of the narrow, late-season stem mines into the belowground parts of the host, coupled with the finding of an older larva in a shoot of new growth relatively early in the growing season, strongly suggests that this insect at least sometimes overwinters as a middle-instar larva in the belowground parts of the host, then migrates into the base of the new shoots in spring, where it finishes feeding. Similar behavior is documented for opostegids in other hostplants in the current study (see records {0339} and {0097}).

With regard to the narrow, late-season mines, the *Mentha* stems bearing these mines were found within only a few meters of *Lycopus* plants that showed similar stem mining. Interestingly, however, the frass patterns in the mines on these two hosts seemed to differ: there was little solid frass accumulation and no central frass line observed in the *Mentha* stem mines, whereas the *Lycopus* stem mines mostly showed a central squiggly line of solid frass (similar to opostegid mines in aerial stems of *Monarda fistulosa*). These differences could perhaps be explained as the work of a single species whose physiology of feeding is different between the two hosts. Another possible explanation is that two different opostegid species could be involved. According to van Nieukerken (1989), *Mentha* is a suspected host for *Pseudopostega crepusculella* in Europe, whereas *Lycopus europaeus* is a confirmed host for a different opostegid species, *P. auritella*.
...
Nieukerken, E.J. van. 1989. Opostegidae. Pages 357-372 in Johansson, R., et al. The Nepticulidae and Opostegidae (Lepidoptera) of North West Europe. Fauna entomologica scandinavica 23:1-739.

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Mimulus

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Mirabilis

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Mitella

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Monarda

[0334 - Monarda]
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In March 2024, I found a rather thick dead stem of a robust wild bergamot plant that was inhabited by a mature cerambycid larva. The larva's excavations began approximately 40-50cm above ground level in the middle-to-upper portion of the stem and led down to the horizontal rooted portion of the stem, where the larva was overwintering. I wrote in my notebook that "the amount of frassification [in the stem] was incredible, and the large grain size of the frass along with the amount of frass tipped me off that it was a [relatively] large [insect], but I thought it would be larger even than this larva." The frass consisted of numerous dry, brown, short-cylindrical pellets densely packed into long agglomerations that stretched for many centimeters through the stem interior. The stout larva was a golden yellow color. I was unable to rear it to adulthood.

In the final days of June 2024, I collected a stem of the host that contained a small but externally visible oviposition scar, accompanied by an egg in the stem interior. The scar consisted of an oval area, roughly 7 mm long by 4 mm wide, from which the outermost layers of stem tissue had been scraped away to produce a flat-bottomed depression, with a small round hole about 1 mm in diameter situated in the center of the oval and penetrating into the stem interior. The egg was smooth and tan in color, cylindrical, and broader and more rounded on one end, tapering along its length to the narrower, more blunted opposite end, the whole egg about 3.5 times as long as its average width.

I stored the section of stem containing the scar and egg in a container with another section of *Monarda* stem from a different individual plant. When I inspected the container and dissected both stem sections several days later, I found that the egg in the first stem section had hatched, leaving behind tattered chorion remnants where the egg had been resting in the stem interior. The hatchling larva had evidently fed on the pith lining the hollow stem interior, based on the presence of several thin, elongate rods of black frass, along with a few white airy frass pellets that appeared to consist of stem pith that had been only minimally processed as it moved through the larva's digestive system. In the bottom of the rearing container was a very young cerambycid larva that was small enough to have recently hatched from the egg and produced the accompanying frass. The second stem section contained an erotylid larva (record {0338}). Though I could not completely rule out the erotylid larva's involvement, I concluded that the cerambycid larva had most likely hatched from the egg in the first stem section, fed for a short time in the interior of the stem, then tunneled downward and out of the stem section, ending up on the bottom of the container. I did not rear this larva to adulthood.

Finally, in mid-August 2024 I found another *Monarda* stem with a cerambycid larva inside. Sclerotized areas of the larva's head and prothorax, though larger and more developed, were otherwise reminiscent of those belonging to the June larva. High in the affected stem were a few places where the larva had gathered its frass into loose clumps, while the lower stem hosted a larger and more dense accumulation of frass along with the larva itself. The frass consisted of dry, light brown, short-cylindrical pellets, very similar to those of the March larva, with some of the pellets affixed end-to-end in chains up to 2 or 3 mm long.

I successfully overwintered this larva, and the adult beetle emerged in spring. It has not yet been conclusively identified to species, but its appearance matches the brief written description of *O. perspicillata* and accompanying images in VanDyk (2026b). Yanega (1996) lists the hosts of *O. perspicillata* as "living blackberry, raspberry, rose" and mentions that "there has been considerable confusion as to its identity in the past; it may still represent more than a single true species" (p. 144). It seems at least some individuals of this species or group of species may consistently be found in association with plants in the mint family; in addition to the rearing in the current record, I have noted a similar-looking *Oberea* species ovipositing in *Blephilia hirsuta* (record {0098}), and there are several images on iNaturalist showing *O. perspicillata* adults perched on mint family plants, although only one of these shows reproductive activity on the part of the beetle, and using a plant as a perch certainly does not by itself indicate the plant is a larval host. Even so I have assembled the iNaturalist records below for reference (Baratta 2022; Cama 2021; Fowler 2024; sheriglow 2024; Wight-Maier 2022). (When tracking down those records, I also noted several images on iNaturalist in which beetles identified as *O. perspicillata* were perched on what appeared to be aster family plants.)

O. perspicillata (as identified visually by iNaturalist users) in association with mint family plants:
- [URL : https://www.inaturalist.org/observations/122314507 : end URL]
- [URL : https://www.inaturalist.org/observations/123153697 : end URL]
- [URL : https://www.inaturalist.org/observations/223210058 : end URL]
- [URL : https://www.inaturalist.org/observations/228753414 : end URL]
- [URL : https://www.inaturalist.org/observations/84432132 : end URL]
...
Baratta, E. 2022. Raspberry Cane Borer (*Oberea perspicillata*). Contributor post on iNaturalist.org. Retrieved February 13, 2026 from [URL : https://www.inaturalist.org/observations/122314507 : end URL].

Cama, R.G. 2021. Raspberry Cane Borer (*Oberea perspicillata*). Contributor post on iNaturalist.org. Retrieved February 13, 2026 from [URL : https://www.inaturalist.org/observations/84432132 : end URL].

Fowler, K. 2024. Raspberry Cane Borer (*Oberea perspicillata*). Contributor post on iNaturalist.org. Retrieved February 13, 2026 from [URL : https://www.inaturalist.org/observations/223210058 : end URL].

sheriglow. 2024. Raspberry Cane Borer (*Oberea perspicillata*). Contributor post on iNaturalist.org. Retrieved February 13, 2026 from [URL : https://www.inaturalist.org/observations/228753414 : end URL].

VanDyk, J., ed. 2026b. Species *Oberea perspicillata* - Raspberry Cane Borer. Species page at BugGuide.net. Retrieved February 13, 2026 from [URL : https://www.bugguide.net/node/view/96073 : end URL].

Wight-Maier, Z. 2022. Raspberry Cane Borer (*Oberea perspicillata*). Contributor post on iNaturalist.org. Retrieved February 13, 2026 from [URL : https://www.inaturalist.org/observations/123153697 : end URL].

Yanega, D. 1996. Field guide to northeastern longhorned beetles (Coleoptera: Cerambycidae). Illinois Natural History Survey Manual 6. 184 pp.

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[0652 - Monarda]
I reared an adult mordellid from *Monarda* stems (evidently overwintered dead stems from the previous growing season) in early July, 2017, but did not record details of the larva's or adult's appearance.

In February 2023, while inspecting dead stems of the host, I encountered two cocoons (one per stem) that appeared to belong to parasitoid wasps that had fed on the insect responsible for tunneling the stems. The cocoons resembled those of mordellid parasitoids I have found in stems of other mint family plants. I saved them for rearing, but in reviewing my notes while preparing this report, I was not immediately able to find whether I reared adult wasps from the cocoons.

Finally, in March 2024 I located and photographed a mordellid larva overwintering in a dead stem of the host. It was yellow in color and very active.
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[0339 - Monarda]
During its first growing season, the larva of this opostegid is most readily detected by the long, narrow linear mines it creates in leaves of its hostplant. But the larva is not restricted to mining leaves. In addition to feeding in the leaf blade, it will enter the leaf midrib and petiole, as well as the main (aerial) stem and lateral shoots. From there, the larva may proceed into the ground-level horizontal rooting stems or the belowground

rhizomes -- covering a distance of several decimeters as it migrates through the body of the plant. The feeding in aerial stems takes the form of shallow, externally visible linear mines with a more-or-less-central frass line. At least initially, these mines do not appear thick enough to have been created by mature larvae, and they often seem to lead all the way down the stem to the ground, disappearing into plant tissues at or below ground level, which suggests that the larvae forming these mines do not finish feeding in the aerial stems. However, in the current study, the lower portion of one aerial stem was found with damage that appeared consistent with what might be expected from a mature opostegid larva completing its feeding here at the end of its first growing season, perhaps then exiting the stem and overwintering as a pupa in a cocoon; nevertheless, the stem damage could not be confirmed as the work of an opostegid, so this finding is inconclusive.

At least some larvae feed within ground-level or belowground parts of the hostplant, to which they presumaby migrate after completing initial feeding in leaves and aerial stems. Dissection of a ground-level horizontal rooting stem in late August revealed tunneling accomplished at an undetermined time by a larva that was no longer present. In early May 2023, a middle-instar larva was found in another ground-level horizontal rooting stem. This stem consisted of still-living plant tissue that had been produced during the previous growing season, and the larva had overwintered inside it or adjacent tissue, judging from the lack of significant aboveground growth of the host, the cool temperatures of the early springtime when the larva was found, and the fact that the larva was sluggish and nearly immobile as if still undergoing diapause. The following year, in late May, mature larvae were found in the lower stems of new shoots of the hostplant. The extent of the tunneling in the new shoots was somewhat limited and confined to a relatively short length of lower stem; the tunnels appeared fairly wide, as if created only by later-instar larvae; and in one plant a blackened tunnel clearly led from the belowground parts into the affected area of the new shoot. This evidence, combined with the relative freshness of the aboveground hostplant tissue, and the fact that larvae reached maturity so early in the season, together strongly suggests that the larvae had migrated into the spring growth from their overwintering location in the ground-level or belowground tissues of the plant. The larvae's feeding in the spring shoots caused the lower stems to discolor and swell slightly. One larva was found inside the terminus of its tunnel in the stem, with its head positioned just below the semicircular exit slit it had just cut in the stem epidermis. After being removed from the stem for photography, this larva promptly spun a rusty-colored, somewhat dorsoventrally flattened ovoid cocoon.

Given the known flight periods of several North American species of *Pseudopostega*, it seems likely that most of these *Monarda*-feeding larvae that mature and pupate in spring emerge as adults a few weeks later. *Pseudopostega cretea* and *P. quadristrigella* adults have both been collected starting in mid-June in Illinois (Harrison 2023), and the flight period for *P. albogaleriella* is reported as "primarily during June and July into early August over the northern part of [its] range" (Davis and Stonis 2007, p. 73). Whichever species is responsible, a significant number of individuals must emerge as adults in time to give rise to a new generation of larvae by sometime in July, because the long linear leaf mines seem to first appear around this time (Eiseman 2022, p. 1733), and at least some of these leaf mines are most likely caused by recently hatched larvae based on their very narrow width and the way they seem to originate in the leaf blade (as if from eggs laid there).

Update, summer 2024 - spring 2025: In September 2024, the middle to upper portion of an aerial stem of the hostplant was found to contain a semicircular exit slit in the middle of a shallowly tunneled area similar in form to a blotch leaf mine. The mined area was approximately 12cm in length, and showed discoloration and buckling of the epidermis similar to the damage described above in spring shoots. Peeling back the epidermis revealed at least two parallel rows of frass in one portion of the mine. The exit slit appeared fairly fresh, suggesting the larva had emerged within the previous month. The tunnel and exit slit characteristics were similar to confirmed opostegid damage in spring shoots as described above, but could not be conclusively identified as such. (See images 339-60 through 339-62 and 339-66, record details page.) Furthermore, in an interesting case of cohabitation, during late May 2025 a wilted shoot of the host was located that contained a recently evacuated opostegid tunnel in the lowermost portion of the stem and, just above this, a

tunnel occupied by a *Papaipema* larva (Lepidoptera: Noctuidae). There was a short region of undisturbed stem (less than 10mm in length) between the areas affected by the opostegid and the noctuid, with no overlap between the areas. (See images 339-67 through 339-71, record details page.)
...
Davis, D.R. and J.R. Stonis. 2007. A revision of the New World plant-mining moths of the family Opostegidae (Lepidoptera: Nepticuloidea). Smithsonian Contributions to Zoology no. 625, 212 pp., 503 figs., 19 maps, 2 tables.

Eiseman, C.S. 2022. Leafminers of North America, 2nd edition. Self-published e-book. Available from the author at [URL : https://charleyeiseman.com/leafminers/ : end URL].

Harrison, T. 2023. Family Opostegidae. On Microleps.org [website]. Retrieved November 5, 2023 from [URL : http://www.microleps.org/Guide/Opostegidae/index.html : end URL].

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[0336 - Monarda]
In December 2016, in a "postage stamp" remnant prairie, I located several slender, spindle-shaped stem galls made by this cecidomyiid and photographed the bright orange larva inside one of them. The larva was ensconced within a narrow, cylindrical, blackened chamber in the pith in the center of the gall. I also located and photographed similar galls in July 2017 and March 2024. The galls seem to be most readily encountered on thin lateral stems branching off the main stem of the host. Identification based on the species account in Gagné (1989).
...
Gagné, R.J. 1989. The plant-feeding gall midges of North America. Cornell University Press: Ithaca, New York.

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Muhlenbergia

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Myosoton

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Napaea

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Nelumbo

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Nepeta

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Oenothera

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Onosmodium

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Osmorhiza

[0351 - Osmorhiza]
I located several dead stems inhabited by overwintering mature or nearly mature larvae in April 2017, and another stem inhabited by an overwintering larva in February 2024. Adults from the 2017 batch emerged by mid-June.
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Oxalis

[0354 - Oxalis]
I found three yellow-orange larvae of this cecidomyiid in a lower stem of the host in mid-July, 2023.
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Packera

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Panicum

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Parietaria

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Parthenium

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Parthenocissus

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Pastinaca

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Patis

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Pedicularis

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Penstemon

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Penthorum

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Persicaria

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Phalaris

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Phleum

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Phlox

[0376 - Phlox]
- Tunnels in stems of the host
- Tunnel walls are distinctly ragged as with other dipteran borers
- Pupation is external, off the plant, with the puparium very small (~2mm in length) and yellow, reminiscent of *Liriomyza*
- The population of this borer I observed in 2023 suffered very high larval mortality, with roughly 66-75% of examined larvae having been killed by a parasitoid wasp or otherwise dying of natural causes before reaching the puparium stage
- Some of the parasitoid wasp larvae spun cocoons in the tunnels not far from their hosts' remains, as shown in the images in the species account at https://insect-pages.github.io/reports/phlox-StBDiptAgro2.html
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[0377 - Phlox]
- Black puparium found just under epidermis of vegetative stem, woodland *Phlox* sp. (apparently *P. divaricata*), November 2021
- The larva's shallow mining around its eventual pupation site resulted in a yellowish discoloration of the stem tissue
- Stalked anterior spiracles of puparium projected through the epidermis
- Also, in 2025, I saw an apparent agromyzid mine straying into the basal portion of a lower stem leaf right where it attached to the stem, suggesting the larva had been mining mostly in the lower stem or horizontal stems of the plant, but I didn't get a clear view
- I believe this insect to be distinct from the two agromyzid stem borers I've found in *Phlox* spp. in the study area (records {0376} and {0379})
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Phryma

[0381 - Phryma]
- Adults found in galleries in pith of dead stems at or near ground level during the dormant season

- Unclear if they were excavating sites to lay their eggs or if they had themselves grown to adulthood in the pith
- Also uncertain if stems were still alive when adults began their activity
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[0382 - Phryma]
Where the larva of this cecidomyiid dwells within the stem of the host, the stem exterior becomes locally discolored -- it blackens and may also show pale areas with dark spots. Furthermore, the discolored tissue sometimes assumes a sunken appearance. Examples I examined as part of the current study displayed the local discoloration of the stem but no visible swelling; however, in some cases, when the discoloration extended into a node, one of the leaves attached at the node was dead and shriveled. Larvae were found in subsurface tissues within these blackened areas of the stem in late September. In one example, the blackened area contained a parasitoid wasp larva instead. The cecidomyiid has been identified as *Neolasioptera* sp. by R. J. Gagné (pers. comm.).
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Physalis

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Physocarpus

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Physostegia

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Pilea

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Plantago

[0387 - Plantago]
I found this local feeder by observing wilted tips of the flowering/fruiting spikes of the host in early July. Just below the wilted portions of affected stems, pale orange cecidomyiid larvae dwelled in the stem interior. One such affected stem contained three larvae, positioned end to end close to one another not far below the stem apex. At least one of these larvae dwelled in a short tunnel with lightly discolored brownish walls; the

tunnel was approximately 10mm long plus the length of the larva. The larval spatula appears to have three teeth on its anterior end, with the middle tooth slightly shorter than the two on the outside.
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Poa

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Polemonium

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Polymnia

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Populus

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Potentilla

[0410 - Potentilla]
I found a wilting individual of the hostplant in my yard in 2023. Dissecting the stem revealed extensive tunneling inside. The characteristics of the plant damage strongly suggested the culprit was a *Papaipema*, but I was unable to confirm this because the larva was no longer present.
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Prenanthes

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Prunella

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Prunus

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Pseudognaphalium

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Pycnanthemum

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Quercus

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Ranunculus

[0437 - Ranunculus]
Larvae form externally visible mines on the stems. Mines of older larvae show a subtle whitish discoloration relative to the ground color of the stem, while the very beginning of a mine that I photographed leading away from an oviposition site was brown. Another photograph shows a small amount of dark green frass at the end of a mine.

When finished feeding, larvae exit the stems through semicircular exit slits, pupating externally. I reared adults in early July from larvae collected in mid-June. The adults were yellow with slightly darker orange and gray markings on the dorsal surface of the thorax.

The host plant was a low-growing and creeping or at least rather prostrate *Ranunculus* living on the banks of a spring-fed stream, the stems moderately hairy with short to medium-length hairs held flat against the stem, the achenes of the plant compact with the main part of the achene roughly circular (i.e. about as long as wide) and the beak short (about a third to a fourth as long as the main part) and in some cases slightly curved at the tip.
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Ratibida

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Rhamnus

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Rhus

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Ribes

[0445 - Ribes]
The life history of this moth was first reported in detail by Grossenbacher (1910), from whom some of the information in the following account is drawn. In Grossenbacher's publication the insect is identified as *Opostega nonstrigella* (a moth currently known as *Pseudopostega albogaleriella*) based on a determination made by A. Busck. This identification was in error; the correct identification for the so-called "gooseberry barkminer" is *Opostegoides scioterma* (Davis and Stonis 2007; van Nieukerken 2016-2024). Complicating matters, some references have evidently confused the erroneous identification *O. nonstrigella* with the name of another moth, *Pseudopostega quadristrigella*, leading certain sources (such as iNaturalist, as of early August 2024) to refer to *P. quadristrigella* as the "gooseberry barkminer." Again, the correct identification for the *Ribes* feeder is *Opostegoides scioterma*.

The larva of this moth forms a looping elliptical tunnel under the outermost layers of the hostplant's stem tissue. Upon maturing in June, the larva abandons the stem via a semicircular exit slit and drops to the ground, where it spins a brownish cocoon (Grossenbacher 1910). Around this time or shortly after, usually by late June, some affected stems will wilt and/or develop a browned necrotic area that covers several centimeters up from near the lower turn of the larva's tunnel. Removing the bark of such a browned area will sometimes reveal cecidomyiid larvae within or adjacent to the tunnels recently abandoned by the opostegid larva. The exact nature of the relationship between the cecidomyiid and the opostegid is unclear, but Grossenbacher (ibid.) found a fungus associated with the cecidomyiid and believed the semicircular exit slit of the opostegid was the weak point that allowed invasion by both the fly and the fungus. R.J. Gagné (pers. comm.) examined photos of the cecidomyiid larvae from the current study and noticed morphological variation that he suggested could possibly be explained by two different cecidomyiid species being present, but this could not be determined with certainty from the photos that were shared with him.

Most of the *O. scioterma* adults observed by Grossenbacher emerged from cocoons between 2 and 10 July. His initial discovery of this moth involved the finding of larvae of different sizes in mid-May, mining both in new shoots and in the transition point between the new shoot and the previous season's growth. Some larvae he found in the upper parts of the new shoots at that time were only about 3mm in length, while those near the bases of the shoots were larger. From this he concluded that adults and/or some pupae lived through the winter and adults oviposited from April through mid-May, with the earliest eggs giving rise to the largest larvae near the bases of the new shoots by mid-May.

However, Davis and Stonis (2007) point out that "adult records of *O. scioterma* do not support an early spring oviposition (i.e., flight) period" (p. 11). Furthemore, evidence from the current study suggests opostegids on *Blephilia*, *Mentha*, and *Monarda* (*Pseudopostega* spp.) often overwinter as middle-instar larvae in perennial belowground tissue of the hosts. Finally, in a paper describing life history details of *Opostegoides minodensis* on *Betula* in Japan, Hara & Yahagi (1990) summarize the results of Kumata (1984) by stating, in part, "it is presumed that [individuals of this moth] overwinter as young or middle-aged larvae" (p. 284; trans. ed. E.J. van Nieukerken). Thus it seems reasonable to suppose that some individuals of *O. scioterma* could follow the pattern of other species in the family and overwinter as early- to middle-instar larvae. Since *Ribes* is a woody perennial, the overwintering location could be the previous season's aboveground canes, from which larvae could migrate into the bases of new shoots in spring. Further investigation would be needed to assess this hypothesis.

Update, 2025: On June 9, I located a *Ribes* shoot with very subtle raised areas and discoloration indicating the shoot had been tunneled by an *O. scioterma* larva. I dissected the shoot and found the larva just below a small externally visible discolored area that may have been the beginnings of an exit tunnel. After photographing the larva, I reintroduced it to a section of *Ribes* stem, where it remained until early on June 11, when I found it crawling on the bottom of the rearing container. I then transferred it to a small vial with moistened potting mix, into which it quickly burrowed, as if in preparation for building a cocoon.
...
Davis, D.R. and J.R. Stonis. 2007. A revision of the New World plant-mining moths of the family Opostegidae (Lepidoptera: Nepticuloidea). Smithsonian Contributions to Zoology no. 625, 212 pp., 503 figs., 19 maps, 2 tables.

Grossenbacher, J.G. 1910. Medullary spots: a contribution to the life history of some cambium miners. New York Agricultural Experiment Station, technical bulletin no. 15 (Nov. 1910), pp. 49-65.

Hara, H. and T. Yahagi. 1990. Notes on the oviposition sites and larval mines of Opostegoides minodensis (Kuroko), a cambium-miner of Japanese white birch. Japanese Journal of Applied Entomology and Zoology 34: 283-287. (*English translation edited by E.J. van Nieukerken*)

Kumata, T. 1984. Insects forming pith flecks in broad-leaved trees. Northern Forestry 36: 120-129. (*NOTE: relevant results of this publication were summarized in Hara and Yahagi (1990) (see above), but were not directly consulted in the creation of the current report.*)

Nieukerken, E.J. van (ed.). 2016-2024. Nepticulidae and Opostegidae of the world, version 2.0. Scratchpads, biodiversity online. Retrieved July 25, 2024 from [URL : http://nepticuloidea.info/ : end URL].

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Robinia

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Rorippa

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Rosa

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Rubus

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Rudbeckia

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Rumex

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Sagittaria

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Salix

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Sambucus

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Sanicula

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Schoenoplectus

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Scrophularia

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Scutellaria

[0654 - Scutellaria]
The lower portion of a dead stem contained a rod of blackened pith with an exit hole. The particular hue and texture of the blackening and the size of the exit hole were both consistent with *Neolasioptera* sign I encountered in stems of other plants as part of the stem insect survey, but in this case no insect remained in the stem and I could not make a certain identification.
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Setaria

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Silphium

[0799 - Silphium]
In January, I dissected a dead stem of the host and found multiple agromyzid stem borer tunnels in the pith of the middle and upper parts of the stem. Each tunnel widened gradually along its length, corresponding to the increasing girth of the responsible larva, and the tunnel walls were ragged in the classic fashion of dipteran borers. The pith immediately surrounding the tunnels was golden yellow in color, while the ground color of the undisturbed pith was white.

One of the tunnels contained a spent puparium with lightly sclerotized posterior spiracular plates bearing weakly developed horns. The puparium appeared to me to have been parasitized, but this was not certain. A second tunnel featured a short terminal portion that curved outward to the outer wall of the stem, where it opened into an oval exit window (typical of agromyzid borers) that had been breached, but oddly, I did not find a spent puparium in the tunnel below this exit window.

Hatfield (2022b, 2023b) documented similar tunnels and puparia in this host in the same local geographic area. It is unclear whether her and my observations all involve a single species of agromyzid. In a study of the stem fauna of *S. laciniata* and *S. terebinthinaceum* in Illinois, Tooker and Hanks (2004) reported no agromyzid borers, but they did rear parasitoid wasps belonging to the braconid genus *Chorebus*, which genus is known to include a number of agromyzid specialists (Eiseman 2022). Additionally, Hatfield (ibid.) reared a braconid from an *S. terebinthinaceum* stem puparium, though the wasp has not yet been identified beyond family level. Images of *Chorebus* adults on BugGuide (Eiseman 2010; Eiseman 2013a-c; Migneault 2014; Palmer 2017) list adult wasp sizes ranging
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from 1.0mm to 3.2mm, well within what would be expected to emerge from a puparium about the size of the one I found. If adults of the agromyzid typically emerge from puparia before winter, then that could explain why my and Hatfield's puparia produced no adult flies and why Tooker and Hanks likewise reared no adult flies. If the typical pupation location of healthy larvae is off the plant, and only parasitized larvae form puparia inside the stem, that could also explain my finding of a vacated tunnel with no puparium inside.
...
Eiseman, C.S. 2010. Winterberry leafminer parasitoid - *Chorebus*. Contributor post on BugGuide.net. Retrieved January 13, 2026 from [URL : https://bugguide.net/node/view/390016 : end URL].

Eiseman, C.S. 2013a. Braconid ex agromyzid ex Hydrophyllum canadense - *Chorebus*. Contributor post on BugGuide.net. Retrieved January 13, 2026 from [URL : https://bugguide.net/node/view/868336 : end URL].

Eiseman, C.S. 2013b. Braconid ex Phytomyza ex Lonicera sempervirens - *Chorebus*. Contributor post on BugGuide.net. Retrieved January 13, 2026 from [URL : https://bugguide.net/node/view/868021 : end URL].

Eiseman, C.S. 2013c. Braconid ex Rubus-mining agromyzid - *Chorebus*. Contributor post on BugGuide.net. Retrieved January 13, 2026 from [URL : https://bugguide.net/node/view/869159 : end URL].

Eiseman, C.S. 2022. Leafminers of North America, 2nd edition. Self-published e-book. Available from the author at [URL : https://charleyeiseman.com/leafminers/ : end URL].

Hatfield, M.J. 2022b. Diptera, stem borings in Prairie Dock. Contributor post on BugGuide.net. Retrieved January 14, 2026 from [URL : https://bugguide.net/node/view/2157824 : end URL].

Hatfield, M.J. 2023b. Diptera, stem of Prairie Dock. Contributor post on BugGuide.net. Retrieved January 14, 2026 from [URL : https://bugguide.net/node/view/2213413 : end URL].

Migneault, R. 2014. Braconid Wasp - *Chorebus*. Contributor post on BugGuide.net. Retrieved January 13, 2026 from [URL : https://bugguide.net/node/view/893043 : end URL].

Palmer, M.W. 2017. Chorebus ex unknown leafmining fly of Lactua - *Chorebus*. Contributor post on BugGuide.net. Retrieved January 13, 2026 from [URL : https://bugguide.net/node/view/1349063 : end URL].

Tooker, J.F. and L.M. Hanks. 2004. Endophytic insect communities of two prairie perennials (Asteraceae: *Silphium* spp.). Biodiversity & Conservation 13(13): 2551-2566.

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[0506 - Silphium]
I first detected this unusual agromyzid miner/borer in 2020, observing the externally visible, shallow, blackened tunnels the young larva creates in midribs and stems of the host during the summer of its first growing season. The tunnels tend to meander irregularly across and around the stem, sometimes forming a spiral or sinusoidal pattern. They also wind through all depths of the stem and vary in color along their length, from black to brown to occasionally white/green, so that they can be quite difficult to follow in places.

Sometimes, when following such a tunnel, I was able to successfully locate the young larva inside it. In one instance the tunnel was shallow enough that the larva's cephaloskeleton could be faintly seen through the outer wall of the stem. Such larvae appeared to be mostly early to middle instars. They were pale whitish with black cephaloskeletons and a pair of very small, light brown, ringlike posterior spiracular areas. My earliest observation of a larva occurred on 29 June.
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In two stems of mature plants I examined in September 2022, the tunnels straightened out as they moved down the stem and, in the lowest 15-25 cm of stem, they appeared to head directly and unwaveringly for the belowground parts of the plant. Even these straight lower stem tunnels had a relatively small diameter, suggesting they were made by early- or middle-instar larvae who still had a ways to go before reaching maturity.

Along with these initial observations during summer and fall, 2020 through 2022, in winter I searched senesced stems bearing old feeding sign of early or middle instar larvae. I gave particular attention to the lowermost portions of the stems near ground level. However, I found no puparia in the stem interiors.

I did not make much further progress understanding this insect until, on 18 May 2025, I discovered that the lowermost stem leaves on a growing shoot of the hostplant (the shoot ca. 20 cm tall) contained tunnels in their petioles. The next day I harvested the shoot and examined its interior. It showed extensive tunneling in the interior, with ~60% of the volume of the upper half of the shoot hollowed out. A large, recently formed agromyzid puparium (length 5.4mm) was positioned in the tunnel at the very tip of the shoot. A much smaller diameter tunnel was visible in the cross section of the cut end of the shoot base, and this tunnel was contiguous with the extensively hollowed area higher in the shoot and also with the tunnels leading into the leaf petioles. This suggested the larva had overwintered in the crown and then moved up into the shoot, where it tunneled in the leaf petioles and stem before pupating at the shoot tip.

The tunnel walls in the lower portion of the shoot were dark brown or black in color, while the fresher excavation higher in the shoot and the tunnels in the leaf petioles were less darkly discolored. A dead stem from last year, which connected to the plant crown near the base of the shoot, contained tunnels of the type observed in mature stems of the host in previous years (described above), leading from the shallow exterior into the pithy interior. These tunnels were much smaller in diameter than the tunnels high in the spring shoot, but approximately the same diameter as the tunnel visible in the cross section of the shoot base. I therefore assumed that the young fly larva made the tunnels in last year’s stem while the stem was still alive during the 2024 growing season, proceeded into the crown to overwinter, then migrated into the new shoot in spring, in which it grew to maturity (creating wider tunnels in the process) and pupated.

Interestingly, this affected shoot, besides the subtle tunnels in the petioles of the lowermost leaves, showed no obvious external sign of the extensive tunneling in the interior. The leaves of the shoot tip appeared to be healthy, as did all the other leaves and the shoot itself, with no wilting or dieback and none of the stem tunneling showing through to the shoot exterior.

An adult agromyzid, cf. *Melanagromyza* sp., emerged from the puparium on 14 June. The fly was one of the largest agromyzids I had ever reared, with body length ca. 4.0 mm (excluding wings) and wing length ca. 3.3 mm. It possessed a shiny blue iridescence on the dorsal surface of the abdomen and a somewhat duller, more blue-green iridescence on the dorsal surface of the thorax. The underside of the abdomen was partly red-brown in color.

This is one of my favorite stem-dwelling insects, not in the least because of the work it took to understand its larval life history!
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Smilax

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Solanum
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Solidago
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Sonchus
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Spartina
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Sporobolus
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Stachys
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Staphylea
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Symphyotrichum
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[0542 - Symphyotrichum]
Tunnels in upper stems. Note resemblance to Doellingeria borer outside the study area.
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Taenidia

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Taraxacum

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Teucrium

[0568 - Teucrium]
Examination of upper stems affected by this borer will reveal large amounts of compacted frass filling the hollow stem interior, while the lower reaches of stem, also fed upon by the larva, show relatively little frass accumulation, suggesting the larva is purposeful about keeping the lower stem tidy and storing most of its frass in a "latrine" as high in the stem as possible. The larva feeds on the pith in the interior of the stem; in some cases, the available pith may consist of little more than a thin layer lining the inner wall of the hollow stem, in which case the larva feeds by scraping away this layer of tissue.

The larva moves from internode to internode by tunneling through the thin wall of tissue at each node. It passes the winter in the lower portion of the dead stem close to ground level. In spring it pupates in the dead stem and adults emerge shortly thereafter. Larvae of the new generation may be active in living stems at least as early as mid-July, based on the finding in 2021 of a young caterpillar in the pith of a stem on July 15 (this larva was not photographed and is thus not shown in the images below).

Both *Endothenia hebesana* and *E. nubilana* have been previously reported from *Teucrium* (Hall et al. 2024; Lam et al. 2011; Miller 1983). The origin of at least some of these reports appears to be work done in Illinois in the 20th century by M. Glenn, who reared *E. nubilana* as a "root borer" and *E. hebesana* as a stem borer both from *Teucrium* (Godfrey et al. 1987). My brief review of images of moths assigned to these two species on Moth Photographers Group (2024b&c) and BugGuide (VanDyk 2026) did not immediately suggest a match with the adults I reared from *Teucrium*, although the plumages in those references were in some cases quite variable within a species. Also, overwintering larvae of *E. hebesana* observed in other hosts in the current study showed a different body color and a much darker head capsule than the current larvae from *Teucrium*. However, I have also observed a larva I believed to be *E. hebesana* tunneling in a living stem of *Teucrium* in midsummer (record {0728}).

The species-level identity of the present *Teucrium* borer remains undetermined.
...
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Thalictrum

[0573 - Thalictrum]
I found a young larva mining a stem of the host in early July. The linear mines were long, narrow, and winding with a brown discoloration and a central line of black frass.
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Thlaspi

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Tilia

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Tragopogon

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Trifolium

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Triosteum

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Typha

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Unassigned

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Unassigned_phenomena

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Unknown_arugula_type

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Unknown_bromus_type_a

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Unknown_bromus_type_b

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Unknown_bromus_type_w

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Unknown_cyperus_type_a

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Unknown_fern_a

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Unknown_fern_b

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Unknown_mint_a

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Unknown_polygonum_type_a

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Unknown_prairie_grass_a

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Urtica

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Vaccinium

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Verbena

[0590, 0592, 0594 - Verbena]
This borer tunnels in upper stems of *Verbena* spp. in early- to midsummer. The larva's activities may result in drooping or dieback of the tip of the stem, at least sometimes because the larva has mined shallowly around the circumference of the stem in a spiral pattern before entering deeper tissues. The stem may swell where this shallow mining occurs, resulting in an externally visible spiral ridge. In *V. stricta*, larval tunneling may

extend into the flowering stalk, with the tip of the spike turning black; this sign can be even be found on the dead stems during the subsequent winter, as shown in the photos below.

I have observed many plants of *V. stricta* and *V. urticifolia* affected by this borer, but so far only a single stem of *V. hastata*. The latter plant seems to be less abundant or less widely distributed in my area, and I have had few opportunities to examine it for sign of this fly.

Late-stage larvae may generate relatively large quantities of solid granular frass that fill portions of their tunnels, which is somewhat unusual among the dipteran borers observed in the current study. The puparium is formed in the stem, with adults emerging a few weeks later, in late July or early August. I reared adults in 2017 and 2021. The species was described in Eiseman et al. (2021).
...
Eiseman, C.S., Lonsdale, O., van der Linden, J., Feldman, T.S., and M.W. Palmer. 2021. Thirteen new species of Agromyzidae (Diptera) from the United States, with new host and distribution records for 32 additional species. Zootaxa 4931(1): 1–68.

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Vernonia

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Veronica

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Veronicastrum

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Viburnum

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Viola

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Vitis

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Xanthium

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Yucca

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Zanthoxylum

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Zinnia

[0690 - Zinnia]
I found a puparium in a tunnel in a living stem in late August.
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Zizia

[0618 - Zizia]
I collected a larva boring in a stem of golden alexanders on 21 May 2017. I reared it on carrot, and the adult eclosed on 12 September.
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- A. Williams and MJ Hatfield provided significant impetus to get me started in my research, including core ideas, practices, and inspiration, and MJ Hatfield has has been a close colleague, mentor, and friend.
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