

# Insects on Mint



This publication was written by Ralph E. Berry, Department of Entomology, Oregon State University, with technical assistance from Glenn Fisher and Joe Capizzi, Extension Entomologists, Oregon State University; Art Retan, Extension Entomologist, Washington State University; Hugh Homan, Extension Entomologist, University of Idaho; and Jim Todd, Agrimanagement, Inc., Yakima, Washington.

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# Field Key for Determining Insects Injuring Mint

## Chewing Insects

- A. Insects feeding above ground on mint foliage or stems.
1. Plants cut-off at, slightly below, or above the soil surface; leaves with ragged edged holes, above ground stems with notches eaten out—Cutworms. Page 1. Figures 1-6.
  2. Ragged-edged holes through the leaves and around the leaf margins particularly on leaves mid-way and higher on the plants—Loopers. Page 3. Figures 7-8.
  3. Terminal leaves and buds tied together with silk. Upper surfaces of leaves skeletonized or with small holes—False celery leaftier. Page 4.
  4. Ragged or completely eaten leaves present around field margins at first. Later, entire field may have ragged appearance—Grasshoppers. Page 5.
  5. Small circular holes or notches chewed in the leaf margins—Root weevil adults. Page 6. Figure 14.
  6. Very small holes in leaves giving a “shot-hole” appearance to the leaves—Mint flea beetle adult. Page 5. Figure 12.
- B. Insects feeding near the soil surface, on rhizomes, or plants fail to grow.
1. Plants cut-off at, or slightly below the soil surface; lower foliage with ragged edged holes—Cutworms. Page 1. Figures 1-6.
  2. Plants show wilted appearance above ground during August, September and early October. Rhizomes with tunneling around the nodes or rhizomes hollow—“Mint root borer.” Page 3. Figures 9-10.

3. Plants slow to grow in the fall and early spring. Surface feeding damage on the rhizomes, roots, and stems. Small “C” shaped white larvae in the roots—Root weevil larvae. Page 6. Figure 13.
4. Plants slow to grow in the spring and with surface feeding or tunneling on the rhizomes and roots. Small white worm-like larvae in the roots. Plants may be reddish colored—Mint flea beetle larvae. Page 5. Figure 11.
5. Plants stunted in irregular spots in the field. Small, white, centipede-like animals feeding on small roots or other underground portions of the plants—Symphylans. Page 6.

## Sucking Insects and Mites

- A. Insects sucking plant juices from above ground portions of plants.
1. Feeding damage caused by small, soft-bodied insects often found in large numbers on the undersides of leaves. Feeding results in discoloration, stunting, leaf curling or damaged buds. Leaves often covered with sticky substance and black sooty mold—Aphids. Page 11. Figure 16.
  2. Feeding damage caused by small, soft-bodied animals visible under magnification. Large numbers found on the undersides of leaves, and often associated with webbing. Feeding causes speckled appearance on the leaves. Leaves may turn brown or bronze and prematurely drop from the plant—Spider mites. Page 7. Figure 15.

## Beneficial Insects

- A. Predators. Page 13. Figures 17-22.  
 B. Parasites. Page 14. Figures 23-24.

Graphs in this bulletin indicate periods of the year when the damaging stages of the insects may be present. Measurements are expressed in metric and can be converted (approximately) using this method: to change centimeters to inches multiply by 0.4; to change millimeters to inches multiply by 0.04.



# Insects on Mint

Mint is a major crop in the Pacific Northwest with more than 55,000 acres of peppermint and 16,000 acres of spearmint valued in excess of \$52 million. The major mint production areas include western Oregon, Washington, and Idaho; central Oregon and Washington; and eastern Oregon. Insects, mites, diseases, and weeds are important in all of the major mint producing areas of the Northwest.

Control of insect pests in mint is becoming increasingly difficult, largely due to the gradual withdrawal of registered uses of persistent insecticides and changes in cultural practices to reduce the spread of verticillium wilt disease. The problem of providing adequate insect control in mint is further complicated by increased restrictions on registration of new insecticides. Therefore, there is a need to better understand the insect complex in mint so that more reliable decisions can be made concerning the necessity of applying control measures. Applying control measures when they are needed rather than

as preventative treatments will reduce the unnecessary use of insecticides and reduce the costs of production as well as conserve natural parasites and predators.

In this publication the insects and similar pests, their life cycles, and their damage are described in such a manner that fieldmen and growers can identify and evaluate many common species encountered in mint fields. Graphs are used to indicate the periods of the year when damaging stages of the insects may be present. Detection methods, economic damage levels, and suggestions for timing of control measures are outlined. Information concerning the use of specific insecticides is not included because registrations and recommendations change frequently. Growers and field representatives should consult their county Extension office or refer to the most current publications dealing with the use of insecticides on mint against pests in their particular growing area.

## Harmful Insects

### Cutworms

Redbacked Cutworm—

*Euxoa ochrogaster* (Guenée)

Variegated Cutworm—*Peridroma saucia* (Hubner)

Spotted Cutworm—*Amathes c-nigrum* (Linnaeus)

Western Yellowstriped Armyworm—

*Spodoptera praefica* (Grote)

#### Description and Life History

*Redbacked Cutworm* (Figure 1, 2)

Mature larvae are 3 to 4 centimeters (cm) long, often with a reddish band on the top, usually extending the entire length of the body. The head and prothoracic shield (plate immediately behind head) are yellowish-brown. There is a pale stripe down the middle of the back, and at each side a dark stripe borders the red band on the back. Adult moths vary in color from pale clay yellow to dark red. Moths have a wing spread of about 3 to 4 cm.

The redbacked cutworm overwinters as an egg in the soil. Eggs hatch in the spring as soil temperatures increase, usually in March and April. Larvae feed beneath the soil surface and above ground for 6 to 8 weeks, with most of the damage occurring in May and early June. When mature, the larvae pu-

pate in earthen cells in the soil. Moths begin emerging in late June and continue emerging until late August or early September. Moths are active at night and females deposit eggs during late August and early September. These eggs undergo embryonic development immediately, then go into diapause (a period of physiologically enforced dormancy between periods of activity) and overwinter. There is only one generation per year.

*Variegated Cutworm* (Figure 3, 4)

Mature larvae are about 5 cm long and range in color from pale gray to dull brown. The body is mottled and streaked with dark brown to black and marked along the side with a pale yellow band. There is a black "W" shaped mark on the top of the last abdominal segment. Yellow spots are present on the top of abdominal segments four to seven. Adult moths have a wing spread of 4 to 5 cm and vary in color from brown to reddish brown, and are usually darker along the outer wing margins.

The variegated cutworm overwinters in the soil or under plant debris as half-grown larvae. The larvae begin feeding in early spring and may do damage to young plants. Larvae mature in late April and May and pupate in earthen cells in the soil. Adults emerge in late May and June and begin de-

positing eggs in clusters of 200 to 500 on the undersides of leaves. Eggs hatch in 4 to 7 days and the larvae begin feeding on plant foliage. Larvae feed for 4 to 6 weeks, then pupate in the soil. Adults emerge in late August and deposit eggs, which hatch into larvae, which is the overwintering stage. There are two generations per year.

#### Spotted Cutworm (Figure 5)

Mature larvae are about 3 to 4 cm long. The general body color is dull brown with brown and black flecks. Larvae have a double row of slanting triangular black marks on the back, which increase in size and prominence towards the posterior (rear) of the body. Larvae have an indistinct dorsal (top) stripe, black spots above the spiracles, below spiracle area abruptly lighter in color. Front wings of adults are purplish to reddish-brown with kidney shaped spots along the front margins. Hind wings are smokey colored with dark outer margins.

The spotted cutworm overwinters in the soil as partially grown larvae. Adults emerge during late May and June and deposit eggs singly in rows or in clusters of up to 200 on the undersides of leaves. Larvae feed on the foliage for 4 to 6 weeks, from late June through July, and then pupate in the soil. Adults emerge in late August and deposit eggs, which hatch into larvae and become the overwintering stage. There are two overlapping generations per year.

#### Western Yellowstriped Armyworm (Figure 6)

Mature larvae are 3 to 4 cm long, with a faint white mid-line stripe on the top of the body. Black triangular marks occur on either side of the mid-line on each segment except the prothorax. These are bordered below by a white stripe on each side. There is a prominent black stripe along each side, bordered below with an orange-brown stripe. Larvae have an inverted white "Y" on the front of their head. Adults have gray or brown front wings with slate and buff colored markings. Hind wings are silvery and gray.

The western yellowstriped armyworm overwinters in the soil as pupa. Moths emerge in March or April and deposit eggs in masses on the foliage. Larvae feed on the foliage for 6 to 8 weeks during May, June, and early July, then pupate in the soil. Adults of the second generation emerge in late August and early September and deposit eggs. The larvae that hatch from these eggs feed on plant foliage during late September and early October before entering the pupal stage to overwinter. There are two overlapping generations per year.

## Damage and Control

### Redbacked Cutworm

This cutworm can be very destructive even when the population is low because individual cutworms can destroy many plants. Newly planted mint is particularly susceptible because larvae concentrate feeding on newly emerging plants. Young larvae feed beneath the soil surface soon after the eggs hatch in the spring causing severe root damage. During May and early June, larvae feed at night on the foliage and hide beneath the soil surface during the daytime. Damage does not occur after mid-June when the larvae form earthen cells and pupate.



Control of this cutworm is very difficult because of its subterranean habits. Larvae are most easily controlled when they are small. Inspect fields regularly to detect the presence of young larvae. Take a minimum of ten 1-square foot (ft<sup>2</sup>) soil samples along two diagonals across the field to assess the cutworm population. Apply treatments to newly planted fields if the average number of cutworms found in the samples exceeds one per square foot. In established fields, do not treat unless the average number of cutworms found in the samples exceeds five per square foot. In old fields or weak fields, treat if the average number of cutworms in the samples exceeds one per square foot.

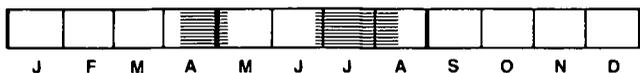
### Variegated Cutworm

This cutworm does not occur in damaging numbers every season, but is probably the most common and destructive species if the population is high. Young larvae may be found feeding on terminal leaves and buds during the day. Older larvae feed on the lower foliage during the night and spend the day time beneath clods or leaves. The most serious damage in mint occurs during mid-July and early August.



The variegated cutworm is most easily controlled when it is small and feeding on the terminal leaves and buds. Inspect fields regularly during late June and early July to detect the presence of small larvae so that applications of insecticides can be timed properly. The presence of young larvae can be assessed with a standard sweep net (see page 15), but detection of older larvae should be done by taking

square-foot soil surface samples, being careful to check for cutworms beneath clods and leaves.



### Spotted Cutworm

This cutworm does not occur in damaging numbers every season, but may co-infest fields with the variegated cutworm. Young larvae feed on terminal leaves and buds, but older larvae feed near the ground. Feeding activity occurs at night, and during the daytime larvae are usually found hiding beneath clods or leaves.

Like other cutworms, the spotted cutworm is most easily controlled when the larvae are small and feeding on the terminal foliage. The presence of this cutworm can be detected simultaneously with the variegated cutworm either with a sweep net for small larvae or square-foot soil surface samples for older larvae.

### Western Yellowstriped Armyworm

Larvae of this cutworm are often aggregated on a few plants rather than widely dispersed in the field. All stages of the larvae are most frequently found on the terminal leaves or buds during the daytime.



The western yellowstriped armyworm is often present at the same time as the variegated cutworm and the spotted cutworm. Larvae can be most easily detected with a sweep net, although older larvae may be found on the soil surface when sampling for the variegated and spotted cutworms.

## Alfalfa Looper

*Autographa californica* (Speyer)

### Description and Life History (Figure 7, 8)

Mature larvae are 2 to 3 cm long and vary in color from a light, translucent green to an intense, dark green, to nearly black. Larvae have a dark stripe in the middle of the back, edged with distinct white lines, bordered by more obscure white lateral lines, and a white spiracle stripe on either side. Centers of the spiracles are white. Larvae have 3 pairs of legs on the thorax directly behind the head, but only 3 pairs of abdominal legs (pro legs), compared to 5 pairs on cutworm larvae. Adult moths have

silvery-gray wings, with a darkening toward the wing tips. The forewings have an ivory-colored, funnel-shaped mark near the center of the wings. Hindwings are brownish, darkening toward the tips. Moths have a wing spread of about 3 to 4 cm and are most active at dusk or night.

The alfalfa looper overwinters as a pupa, either in the soil or in plant debris near the base of host plants. Moths begin emerging in late March or April and adults lay eggs singly on weed hosts, particularly wild mustards. Eggs hatch in 3 to 5 days and the larvae feed for about 2 weeks before pupating in cocoons on the host plant or in plant debris. The total developmental time from egg to egg requires about 30 days. Adults emerge in about 7 days, mate, and females deposit eggs about 3 days after emerging. There are 2 to 3 generations each year, but larvae from the second generation cause the most serious damage in mint, during late June and July. Larvae of the alfalfa looper may occur at the same time as the variegated and spotted cutworms and the western yellowstriped armyworm.

### Damage and Control

Looper larvae smaller than 1.5 cm feed on and scar leaf surfaces. Larvae, which are larger than 2 cm long, eat ragged edged holes through leaves or eat in from the leaf edge, leaving ragged edges. Unlike most cutworms, loopers can be found feeding on the foliage during the daytime, but are easily disturbed and may drop off the plant. The most serious damage caused by loopers occurs during late June and July.

Loopers, like cutworms, are difficult to control when they are large. Fields should be inspected for the presence of small larvae regularly during late June and early July so that applications of insecticides can be properly timed. Use a standard sweep net and take a minimum of 100 sweeps in groups of 10. Since loopers often occur during the same time as some cutworms (variegated, spotted and western yellowstriped armyworm), square-foot soil surface samples should also be taken to determine if these other pests are present.



## “Mint Root Borer”

*Fumibotys fumalis* (Guenée)

### Description and Life History (Figure 9, 10)

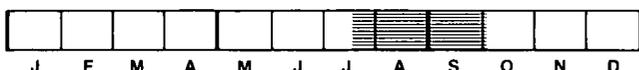
The 1st-stage larva is 2 to 3 mm long and yellow to light green in color, with darker longitudinal

bands on the back. This stage feeds on the upper surface of the leaf for 4 to 5 days, then drops to the soil surface and enters rhizomes. Larvae feeding within rhizomes are uniformly yellow-tan with a reddish-brown head and reach about 19 mm when mature. Pre-pupae are encased in a silk-lined, earthen cell about 17 to 18 mm long. They are cream colored, with enlarged segmentation. Pupation occurs within the earthen cell. Pupae are light reddish-brown, and about 9 mm long. Adult moths are fawn to chocolate brown, with a darker, wavy line on the forewings and an indistinct dark spot midway near the outer wing margin. The wing spread is about 2 cm.

“The mint root borer” overwinters as a pre-pupa within an earthen cell 1 to 2 cm below the soil surface. Pupation occurs within the cell during the spring and adults begin emerging in late May and early June. Adult emergence continues through the summer until late August, with peak emergence occurring during July. Adult females deposit eggs that resemble tiny scales along the leaf veins on the upper surfaces of leaves. Eggs hatch in 9 to 10 days and the 1st-stage larvae feed on the leaf surface for 4 to 5 days before dropping to the soil surface in search of rhizomes. Larvae enter the rhizomes by chewing small holes at the bases of the buds. Larvae feed in rhizomes for 70 to 80 days during August, September, and early October, before emerging from the rhizomes and constructing the earthen cell in which they overwinter. There is a single generation each year.

### Damage and Control

The “mint root borer” has been found in the Willamette Valley of western Oregon, north central Oregon, and in Yakima County of central Washington. Damage to foliage by the 1st-stage larva is minor, but the damage caused by the larger larvae boring in peppermint rhizomes severely weakens plants so that their susceptibility to winter injury is increased. Larval damage is most evident during late August and September, and is recognized by wilted plants during the regrowth stage following harvest. Damage may appear spotty at first, but larvae commonly move from rhizome to rhizome causing the infested areas to become larger.



Infestations of larvae can be assessed by examining the rhizomes beneath wilted plants, or if wilted

plants are not present, by taking square-foot soil samples and examining the rhizomes. Damage by small larvae is most evident as tunneling on the surface or just beneath the surface of the rhizome around the bud or node.

## False Celery Leaftier

*Udea profundalis* (Packard)

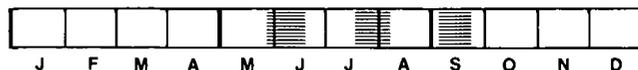
### Description and Life History

Mature larvae are about 2 cm long, pale green, with a broad white stripe running lengthwise on the back. This white stripe is broken by inconspicuous, darker lines on either side of a dark green median stripe. Adult moths closely resemble adults of the “mint root borer” and cannot be differentiated easily. Wings of the false celery leaftier are lighter brown or fawn colored, marked with two distinct, dark, wavy lines and two dark spots on each wing. The wings also have a row of small, distinct spots along the margins. The markings on the wings of the false celery leaftier are more distinct than those on the “mint root borer.” The wing spread is about 2 cm. When disturbed, the adults fly with a quick, jerky motion, seeking shelter on the undersides of leaves after a very short flight.

This pest overwinters as a pupa in plant debris, in and around the margins of mint fields. Adults emerge in the spring and begin laying flattened, scale-like eggs, singly or in overlapping groups on the undersides of leaves near the soil. Eggs hatch in 7 to 10 days and the larvae pass through five instars during a 2 to 3 week feeding period. Mature larvae form a shelter by rolling the edge of a leaf and fastening it together with threads of silk. Larvae spin a silken cocoon inside this shelter and change to the pupal stage. Adults emerge in about 2 weeks. The length of the entire life cycle is about 40 to 60 days. There are 3 generations per year.

### Damage and Control

Larvae of the false celery leaftier feed on the undersurfaces of foliage and on buds. The larvae produce a silk web that may enclose several leaves or just draw the parts of a single leaf together. Feeding damage is most evident in the spring, when plants are small. Severe damage seldom occurs and is not usually considered to be economically important on mint.



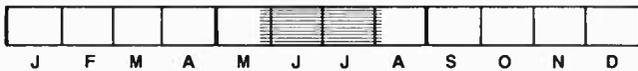
# Grasshoppers

- Migratory Grasshopper—*Melanoplus sanguinipes* (Fabricius)
- Redlegged Grasshopper—*Melanoplus femurrubrum* (De Geer)
- Twostriped Grasshopper—*Melanoplus bivittatus* (Say)
- Clearwinged Grasshopper—*Camnula pellucida* (Saedder)

## Description and Life History

There are many species of grasshoppers in the Pacific Northwest, but only a few damage mint. Damage caused by grasshoppers is sporadic and is usually most severe in fields close to rangeland, waste areas, or legume and grass fields harvested prior to mint. The migratory grasshopper is probably the most important. Immature nymphs are wingless and smaller than adults. Adult grasshoppers are 30 to 40 mm long, hard bodied, with well-developed wings and jumping legs.

Most grasshoppers that attack mint overwinter as eggs in the soil about 2 to 3 cm deep. Eggs are deposited in pods containing 20 to 100 eggs each, depending on the species. Eggs are deposited during late summer or early fall around field margins, in bare areas in mint fields, in uncultivated land, or in well-defined breeding and egg-laying areas as is the case with the clearwinged grasshopper. Eggs hatch in mid-May, June, and early July. Nymphs feed for 40 to 60 days before changing into the adult stage. Adults disperse to mint and other suitable host plants when the population increases or when food becomes scarce. Adults mate in late summer and soon deposit the overwintering eggs. There is one generation per year.



## Damage and Control

Grasshopper damage in mint generally occurs during late June, July, and early August, when nymphs move into the field from margins or when adults migrate from adjacent areas already harvested. Nymphs and adults feed on mint leaves, causing ragged edged holes, or they may consume the entire leaf. Serious yield losses can result if the population of grasshoppers reaches 6 to 8 per square yard. Grasshopper populations can be estimated with a sweep net during May, June, and July when fields are being sampled for cutworms and loopers. Grasshoppers are easiest to control when they are immature and before they have developed

wings. In many instances when damage occurs around field margins, a border treatment may be adequate to control the infestation. For grasshoppers it is important to observe their presence and activity in adjacent fields. Migration out of these fields is often immediate if the crop is harvested and possible control should be anticipated in mint fields.



Adult Grasshopper

# Mint Flea Beetle

*Longitarsus waterhousei* (Kutschera)

## Description and Life History (Figure 11, 12)

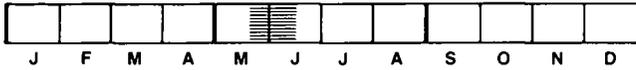
Larvae are slender and worm-like, about 0.5 cm long when mature. They are white, with a shining, pale-brown head and three pairs of legs. Adults are small, elongate-oval beetles, about 0.25 cm long, pale brown or brownish-yellow in color, with a darker, reddish-brown head. The hind legs are long and thickened for jumping.

Mint flea beetles overwinter in the soil as eggs. Eggs hatch into tiny larvae during May. Larvae begin feeding on small roots and then tunnel in larger roots and underground stems. Feeding continues for 30 days and mature larvae leave the roots to make small cells in the soil where they form the pupal stage. Adults emerge in 3 to 4 weeks, during July, mate, and begin depositing eggs about 3 weeks later in early August. Egg laying may continue into the fall or until freezing weather occurs. There is one generation per year.

## Damage and Control

The larvae cause more serious damage than the adults, since they feed on the underground roots and stems. Larvae feed on small roots first, but later tunnel into roots and stems. Damage is most noticeable during late May and early June, and affected plants may be stunted and reddish-purple in

color. Adults chew small holes in the undersides of mint leaves, resulting in a shot-hole appearance on the foliage. Adult damage is most evident during July and early August. Insecticides are needed to control adult beetles before they deposit eggs.



Males lack wings, but females have fully developed wings and are able to fly short distances. The adults feed primarily at night, in the early morning, or in the late afternoon. During the hot part of the day the beetles remain hidden among dead leaves or other objects beneath the plants. Adults move rapidly from fields in which the mint has been cut to seek shelter in nearby standing mint. Under certain conditions, there may be a migration back and forth between fields. When no second-growth mint is present in the cut field to give protection to the beetles, most of them will move to field margins or to adjacent fields.

Natural spread is by gradual migration from infested to uninfested fields. The infestation also may be spread by means of eggs carried to new plantings when roots are dug from infested fields and the soil is not thoroughly shaken from the roots.

## Strawberry Root Weevil

*Otiorhynchus ovatus* (Linnaeus)

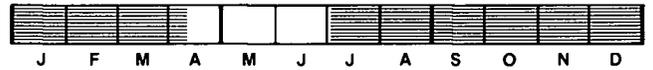
### Description and Life History (Figure 13, 14)

Newly hatched larvae are white, with conspicuous orange-brown head capsules, and are about 0.5 mm long. As the larvae grow they become more grub-like in appearance. Mature larvae are 6 to 7 mm long, legless, creamy-white in color, and "C" shaped. Adults are commonly called "snout beetles," and are oblong-oval in shape and average about 5 mm in length. Color varies from light to dark brown or nearly black, the legs and antennae are reddish-brown. Adults cannot fly.

The strawberry root weevil overwinters as larvae in the soil. Larvae mature during late April and early May and form a cell in the soil, where they pupate. Adults begin emerging during mid-May and are present in the mint fields until late July. Adults begin depositing eggs around the bases of plants about 3 weeks after emergence. Most of the eggs are deposited during late June and July, and most adults are gone by early August. There is one generation per year.

## Damage and Control

Larvae begin feeding on small roots shortly after hatching from the eggs. Larvae feed during late summer and early fall, then resume feeding in the spring during April and May. In Western Washington and Oregon, where winters are mild, the larvae may continue feeding during the winter months. Larval populations may be assessed by taking soil samples and examining the soil around the root system. Adult damage, which may be evident during late May, June, and July, consists of small notches on the leaf margins. Adult feeding usually is inconspicuous and is not considered economically important although insecticides may be used during late May or early June to control adults before they deposit eggs. Adults feed at night and spend the daytime beneath leaves or debris on the soil surface. Adult populations can be estimated with a sweep net (see page 15), but samples should be taken 1 to 2 hours after sunset when adults become active.



Natural spread is by gradual migration from infested to uninfested fields. Since adults are unable to fly, serious infestations do not develop until fields are 3 to 4 years old. Infestations also originate when roots for new plantings are dug from infested fields unless all soil is removed from the roots.

## Garden Symphylan

*Scutigereilla immaculata* (Newport)

### Description and Life History

Symphylans are 3 to 4 mm long, white, soft-bodied, "centipede-like" animals, with prominent antennae. Symphylans are not true insects, since they possess 12 rather than 3 pairs of legs in the adult stage. Newly hatched nymphs have 6 pairs of legs, but at each molt an additional pair of legs is added, until the adult stage is reached. Eggs are laid in clusters at varying depths in the soil. Eggs are white when first laid, but gradually turn light tan in color. The eggs are covered with a network of tiny ridges.

Eggs, nymphs, and adults can be found in any month of the year, but the majority of the eggs are found during the early spring and fall months. Nymphs and adults become active in the spring and can be found in increasing numbers in the upper 15 to 20 cm of soil from about April through August.

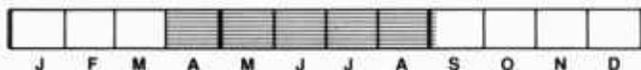
Eggs are deposited in clusters of 4 to 25 at various depths, depending on soil temperature, moisture, and structure. Eggs hatch in 30 to 40 days and nymphs begin feeding on small roots. The total developmental time from egg to adult is about 5 months at 10°C (50°F). Nymphs and adults move freely in the soil and seek depths where favorable temperature and moisture occurs. Cool temperatures during the fall and winter and extreme dryness in the summer will force them deeper. There are one to two generations per year.



Symphylan

### Damage and Control

Symphylans are an economically important pest on mint in western Oregon and Washington, but are of lesser importance in other mint growing areas of the Pacific Northwest. Symphylans feed on the root system of plants, causing slow growth and stunting. Before planting mint, survey fields for the presence of symphylans. Determine the symphylan population by counting and averaging the number of symphylans found per shovelful of soil. Sample before extensive tillage, during the period from April through August, when symphylans are closest to the soil surface. A definite problem exists if you find an average of 10 or more symphylans per sample of soil after taking 30 or more representative, random samples throughout a field. Symphylans are often found in high numbers in localized or "target" areas. If you encounter one of these target areas, pay particular attention to define the limits of the infestation. This may simplify control measures. When control is necessary, preplant treatments are most effective. Several natural enemies, such as centipedes and mites, feed on symphylans, but their populations are not high enough to reduce heavy infestations of symphylans.



## Twospotted Spider Mite

*Tetranychus urticae* (Koch)

### Description and Life History (Figure 15)

Twospotted spider mites are not insects but, rather, are closely related to spiders. They range in size from 0.25 to 0.5 mm long. Adults and nymphs have eight legs, but larvae have six. The twospotted spider mite is pale yellow, translucent reddish, or greenish, with two dark spots on the back. These spots are indistinct on the nymphal stages. Eggs are round and nearly transparent. The presence of webbing on the undersides of leaves is often associated with mite infestations.

Female spider mites overwinter in cracks and crevices in the soil and beneath debris in and around margins of mint fields. They emerge in the spring and begin depositing eggs on the undersides of leaves. Eggs hatch into larvae in 4 to 5 days. The life cycle from egg to adult requires 1 to 3 weeks depending on temperature. There are many overlapping generations each year. Adults migrate to overwintering sites in the fall.

### Damage and Control

The twospotted spider mite is a serious pest in all mint growing areas of the Pacific Northwest except western Oregon and Washington where populations generally remain below damaging levels. Spider mites feed by sucking out the contents of the leaf cells, including the chlorophyll. This damage causes a mottling of the leaves, which become brown or bronze. Damage to the foliage reduces the vigor of the mint and heavy infestations cause the lower leaves to drop.

You can determine the spider mite population by taking leaf samples from mid-way up the plant and examining the undersides of the leaves with a hand lens of at least 10x magnification. Check a minimum of 100 leaves at random throughout a field. In large fields (50 to 100 acres) sample a minimum of 200 leaves. If the population averages 10 to 20 nymphs and adults per leaf and there are numerous eggs, but few predators, the field should be treated. If egg density is lower than adult and nymph density, it may indicate a declining mite population. Resample the field before determining the need for treatment. Check fields at 7 to 10 day intervals during late June, July, and August to monitor changes in the population. Predator mite populations of 1 per leaf may reduce or maintain the mite population below damaging levels.





Figure 1. Redbacked Cutworm Larva

*Harmful*



Figure 2. Redbacked Cutworm Adult

*Harmful*



Figure 3. Variegated Cutworm Larva

*Harmful*



Figure 4. Variegated Cutworm Adult

*Harmful*



Figure 5. Spotted Cutworm Larva

*Harmful*



Figure 6. Western Yellowstriped Armyworm

*Harmful*



Figure 7. Alfalfa Looper Larva

*Harmful*



Figure 8. Alfalfa Looper Adult

*Harmful*



Figure 9. Mint Root Borer Larva

*Harmful*



Figure 10. Mint Root Borer Adult

*Harmful*



Figure 11. Mint Flea Beetle Larva

*Harmful*



Figure 12. Mint Flea Beetle Adult

*Harmful*



Figure 13. Strawberry Root Weevil Larva

*Harmful*



Figure 14. Strawberry Root Weevil Adult

*Harmful*

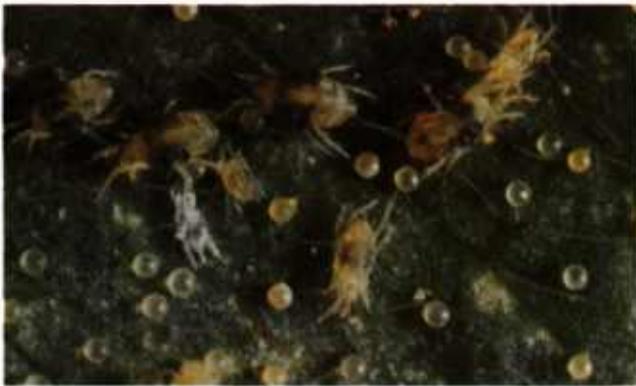


Figure 15. Twospotted Spider Mites

*Harmful*



Figure 16. Mint Aphid

*Harmful*



Figure 17. Lady Bug

*Beneficial*



Figure 18. Lady Bug Larva

*Beneficial*



Figure 19. Syrphid Fly

*Beneficial*



Figure 20. Syrphid Maggot

*Beneficial*



Figure 21. Lacewing

*Beneficial*



Figure 22. Lacewing Larva

*Beneficial*



Figure 23. Ichneumonid Wasp

*Beneficial*



Figure 24. Parasitized Cutworm

*Beneficial*

## Mint Aphid

*Ovatus crataegarius* (Walker)

### Description and Life History (Figure 16)

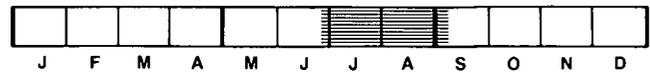
Wingless mint aphids are yellow-green to apple-green, mottled with darker green. They range in size from 1.5 to 2 mm long. Winged aphids have a dark brown head and thorax with a yellow-green abdomen, and are 2 to 3 mm long.

The mint aphid overwinters around the base of mint plants, beneath plant debris, and in cracks and crevices in the soil. In the spring, females give birth to living nymphs, which feed on stems and undersides of mint leaves. Rates of development and population increase vary with temperature, but during the summer and early fall, a generation may be completed in 7 to 10 days. As many as 12 to 15 generations may be produced each year.

### Damage and Control

The mint aphid damages plants by inserting its mouthparts into plants and sucking out the juices. Feeding by large numbers of nymphs and adults discolors the foliage, stunts plant growth, causes curled leaves, and damages buds. The mint aphid attacks both peppermint and spearmint, but larger populations develop on spearmint. This pest is seldom economically important in Oregon, but is occasionally a serious pest in Idaho and Washington, particularly on spearmint. Maximum populations occur at about full bloom and the plants may become sticky with honeydew secreted by the aphids. Large amounts of honeydew interfere with harvest and promote the growth of molds that may impart off-flavors to the oil.

The aphid population can be estimated at the same time leaves are being sampled for spider mites. The number of aphids that will cause an economic loss has not been determined.



## Beneficial Insects

### Lady Beetles

Convergent Lady Beetle—*Hippodamia convergens*  
(Guérin-Ménéville)

Transverse Lady Beetle—*Coccinella transversoguttata* (Faldermann)

### Description and Life History (Figure 17, 18)

Several species of lady beetles are common to the Pacific Northwest, but the convergent lady beetle is the most common. Adult beetles are about 4 mm long, oval and convex in shape, reddish-orange, with black spots on the wings. Adults have two converging white lines on the black midsection, or thorax. Larvae are gray or bluish-gray, with numerous yellow, white, or red spots. Mature larvae are about 9.5 mm long. Eggs are football-shaped, yellow or orange, and laid on end in clusters on the undersides of leaves.

Lady beetles overwinter as adults in aggregations in protected places in wooded or mountainous areas or in crop land. They migrate to fields in March, April, and May and locate aphids. After feeding on the aphids for a short period of time, they deposit eggs on plants infested with the aphids. Eggs hatch in 5 to 7 days, and the tiny larvae begin feeding on

small aphids or other prey. Soon after the larvae mature, they form a pupa on the plant and adults emerge about a week later. A complete life cycle requires 4 to 6 weeks. There are several overlapping generations each season before adults migrate back to overwintering sites in the fall.

### Importance

Adults and larvae feed on aphids and other soft-bodied insects. Even though lady beetles are excellent predators, often they are unreliable because they will disperse when aphid populations are low and they do not increase rapidly enough to overcome heavy aphid infestations. Female beetles consume about 100 aphids before depositing eggs, then about two aphids per day for each egg produced.

### Syrphid Flies

Several species

### Description and Life History (Figure 19, 20)

Adult flies are 10 to 12 mm long, with bodies marked with yellow, black, or white bands resembling bees or yellowjackets. They fly swiftly, yet

tend to hover over plants. Adults feed only on pollen, nectar, and honeydew. Larvae are about 12 mm long, wrinkled or slug-like in appearance, tapering to a point at the head. They are usually brown or green with whitish areas. Eggs are chalky white, with faint longitudinal ridges.

Syrphid flies overwinter as pupae in the soil or above ground in leaves and plant material. Adults begin emerging in May and June, about the time aphid populations begin to increase. They lay eggs on leaves and stems of plants infested with aphids or other suitable prey. Larvae feed for 7 to 10 days, then drop to the soil to pupate. A life cycle is completed in 16 to 28 days and there are 3 to 7 overlapping generations each year.

### Importance

Larvae feed on soft-bodied insects, particularly aphids. As many as 400 aphids may be consumed by one larvae during its development period. Larvae seize aphids with their mouth hooks and suck out the body contents. These predators are found commonly in most mint fields and are important in regulating aphid populations.

## Green Lacewing

*Chrysopa Carnea* (Stephens)

### Description and Life History (Figure 21, 22)

At least two species of green lacewing and one brown lacewing species may be found in mint fields, but the green lacewing is the most common. Adults are green to yellowish-green. They have four, delicate transparent wings with many veins and crossveins. Adults are about 18 mm long, with long hair-like antennae and red-gold eyes. Larvae are slender, mottled gray or yellowish-gray, and about 9.5 mm long. Eggs are pale green, almost white, and are laid singly on long, slender stalks on plant foliage.

Lacewings overwinter as pupae in protected places such as cracks and crevices. In warmer areas, adults may be present year around. Adults emerge in early spring and begin laying eggs almost immediately on plants infested with prey. There are five or six overlapping generations each season.

### Importance

Adults feed on honeydew or sweet plant exudates. Larvae feed on many soft-bodied insects,

such as aphids, spider mites, immature bugs, and leafhoppers. They are effective predators when prey is available, but their populations often lag behind those of their prey. They may not provide satisfactory control of heavy infestations of pest insects.

## Damsel Bug

*Nabis alternatus* (Parshley)

### Description and Life History

Adult bugs are tan or gray, with piercing-sucking mouthparts and enlarged front legs for grasping their prey. They have slender bodies, and are about 10 to 12 mm long. Nymphs resemble adults, except they are smaller and have no wings.

Damsel bugs overwinter as adults in protected places and appear in the field in April or May. Adults begin laying eggs soon after emergence. Eggs are deposited in soft plant tissues. Eggs hatch into nymphs, which feed on small insects or eggs. There are numerous, overlapping generations during the season.

### Importance

Adults and nymphs feed on many soft-bodied insects, including aphids, spider mites, leafhoppers, and small caterpillars. Adults are swift and aggressive, and rapidly suck the body contents from their prey.



Adult Damsel Bug

# Bigeyed Bug

*Geocoris Pallens* (Stol)

## Description and Life History

Adults are about 3 to 6 mm long, buff gray or blackish in color. They have large, prominent eyes. Nymphs resemble adults except in size and absence of wings.

Bigeyed bugs overwinter as adults in trash, crop debris, or other protected areas. Adults appear in the spring and begin feeding on available prey. Females deposit eggs in plant tissues. The eggs are somewhat cylindrical, ribbed, and pink or yellowish-white colored. Eggs hatch into nymphs, which feed on prey for several weeks before molting to the adult stage. There are usually two generations per year.

## Importance

Adults and nymphs feed by sucking the body fluids from their prey. Both feed on aphids, spider mites, and other soft-bodied prey.



Adult Bigeyed Bug

# Minute Pirate Bug

*Orius tristicolor* (White)

## Description and Life History

Adults are oval-shaped, about 3 mm long, very flat, and marked conspicuously with black and white. Nymphs are soft-bodied, yellow or amber colored. Nymphs and adults have piercing-sucking mouthparts enclosed in a long beak.

The minute pirate bug overwinters as an adult in protected areas, such as under tree bark or boards, around homes or other buildings and in debris around fields. Adults emerge during early spring

and females insert their eggs in plant tissues. There are 3 or 4 generations each year in the Pacific Northwest.

## Importance

Adults and nymphs are very active predators and may be found on all above-ground parts of plants. Active stages feed by sucking the body fluids from aphids, spider mites, and immature stages of many small insects.



Adult Minute Pirate Bug

# Predator Mites

*Typhlodromus* spp.

## Description and Life History

Predator mites are effective and widespread predators of injurious plant-feeding spider mites on mint, although their specific function as population-regulating agents has not been studied thoroughly. Predator mites are similar to the two-spotted spider mite in size (0.25 to 0.5 mm), but are more flattened and lack spots. They pass through the same developmental stages, from egg to larva with 6 legs, through nymph stages to the adult, with 8 legs. The life cycle of predator mites is somewhat shorter than plant-feeding mites, averaging 6 to 7 days, depending on the temperature. There are many overlapping generations each year, and like the twospotted spider mite, the female overwinters in protected places beneath plant debris or in cracks and crevices in the soil.

## Importance

Female predator mites produce 30 to 60 eggs, which is generally equivalent to the number produced by the prey. This phenomenon reduces the lag of predator populations behind that of the prey,

and accounts for the effectiveness of many mite predators. Also, the predators respond quickly to increasing abundance of prey, resulting in the ability to rapidly increase their numbers when plant-feeding mite populations are high. In determining need for chemical controls it is essential that predator mites be counted along with injurious mites when sampling mint leaves. (See survey instructions under twospotted spider mite.) The ratio of predator mites to plant feeding mites and the population trends may be useful to determine whether or not treatment is needed. Unnecessary treatment with insecticides reduces the predator mite population, which could result in a rapid build-up of injurious plant-feeding mites.



Predator Mite

## Parasites

### Several Species

#### Description and Life History (Figure 23, 24)

Many naturally occurring parasites are important in regulating insect populations on mint. Parasites attack eggs, larvae, and pupae of insects such as cutworms and loopers, and aphid nymphs and adults.

Parasites are either Hymenoptera (wasps) or Diptera (flies), and range in size from 1 to 20 mm. The size of the parasite is related to the stage or size of the host insect. Some parasites attack different hosts, and in some cases, several individuals of the same species may develop in one host insect simultaneously. The stages usually seen in the field are the adults or the pupae since many female parasites lay their eggs inside the host. When the eggs hatch, the parasite larva(e) feed on the stored food (fat bodies), the reproductive organs, muscles and other body contents of the host. When mature, larva pupate either inside or outside of the hosts. The life cycle of parasites is synchronized with that of their host, insuring that parasites and hosts are present at the same time in the field.

#### Importance

In most instances, development of parasite populations lags behind that of the host, which may result in large numbers of hosts being present before sufficient numbers of parasites are present to control pest populations. Nevertheless, parasites are important regulating factors of pests in mint, particularly cutworms, loopers, and aphids. Parasitized insects frequently are conspicuous enough to be observed in the field, usually swollen and immobile. If the parasite has matured, the host may be covered with tiny cocoons or it may be hollow. Parasites of aphids form cocoons either in or under the swollen, tan, mummified skeleton of the aphid. These aphid "mummies" may be found on leaves and stems of mint during the growing season. It is important to look for parasitized insects when fields are being routinely sampled for the presence of pest insects. If a large number of parasitized insects are found, it may not be necessary to treat with an insecticide. When control of pest insects is necessary, beneficial insects may be conserved by spot treatment, using an insecticide with short residual action, or choosing a more selective insecticide.

Generally, avoid using any insecticide unless it is absolutely necessary.

### Sweeping With an Insect Net

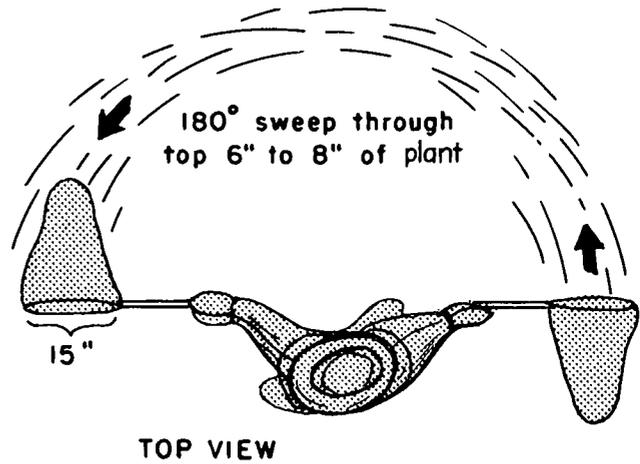
Sweeping mint fields with an insect-gathering net and examining plants for evidence of insect injury may help avoid unnecessary insecticide applications, and assure proper timing of applications.

A standard sweep net has a diameter of 15 inches. The bag or net should be attached to a sturdy wire frame with a handle 26 inches long. Sweep nets can be made or purchased. Some insecticide dealers keep them in stock. If not, they, or your Extension agent can determine a source.

In using a sweep net, develop a uniform sampling technique. This permits comparisons. Each sweep should cover an arc of 180 degrees, with the net striking the upper 6 to 8 inches of the plant as shown below.

Even though economic damage levels have not been determined for some insects on mint, the use

of a sweep net will establish the presence of insects on the upper foliage and can be helpful to growers and field representatives in assessing potentially damaging populations.





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