A Pocket Guide to IPM Scouting in Wild Blueberries

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Acknowledgement: Design and layout by Phoebe Nylund

Using this Scouting Guide

This guide was developed as a pocket reference book for easy use. It is patterned after *A Pocket Guide to IPM Scouting in Highbush Blueberries,* Michigan State University Extension Bulletin E-2928. Since there are significant differences in the growth habit and management of wild lowbush versus cultivated highbush blueberry, this guide was designed to be specific for wild blueberry pests and scouting practices. This guide provides a summary of the information found in the *Wild Blueberry Growers Guide* available on the University of Maine website www.wildblueberries.maine.edu or on CD in Adobe PDF format.

Other Web resources that provide wild blueberry IPM information include: http://www.nsac.ns.ca/wildblue/facts/index.htm

Why Use IPM

Integrated Pest Management (IPM) is an approach to managing weeds, diseases and insect pests in blueberry fields for the best economic and environmental results. This comes about when the potential cost of crop loss due to pests equals the cost of controlling the pest, NOT by treating fields that have no or extremely low pest densities.

Regular scouting is the foundation for IPM. Detecting pest problems early and accurately will allow you to manage pests and avert crop loss with fewer resources and less environmental impact.

Monitoring insect, disease and weed populations as well as fertility and pH regularly, provides information for making sound pest and nutrient management decisions.

How to Scout

Scouting for pests, diseases and weeds requires monitoring fields on a regular basis and recording your findings. IPM data sheets are available as part of Fact Sheet 204, *Integrated Crop Management Field Scouting Guide for Lowbush Blueberries* http://www.wildblueberries.maine.edu/TOC.htm

Different insects and diseases require monitoring at different times in the growing season, see scouting chart on page 7 in this guide for major pests and time of appearance.

By understanding the basic biology and life cycles you will be able to predict when pests are likely to cause damage. This knowledge will allow you to determine when to monitor pest densities to determine if they occur in damaging numbers.

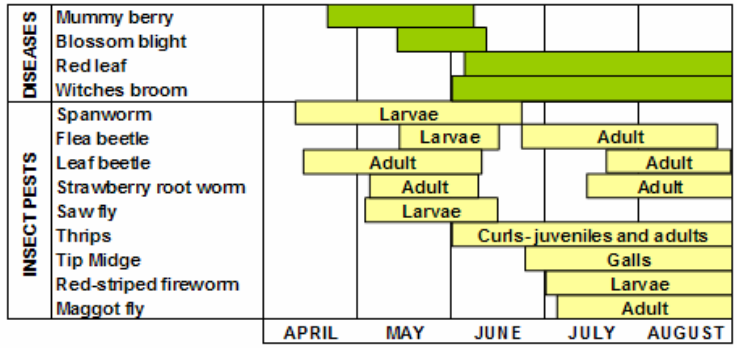
Learn to identify disease, insect and weed life stages and the damage they can cause. Look carefully for disease symptoms after prolonged wet periods.

Develop a field history with locations of areas most affected by pest and disease outbreaks in your field. Draw maps of these high risk areas and monitor them more intensely.

Keep track of weather and pesticide applications to distinguish pest damage and disease from physiological disorders and pesticide injury.

Weather monitoring of minimum-maximum temperatures and precipitation can explain weather related disorders such as cold injury and are used to predict when diseases and blueberry maggot flies will occur.

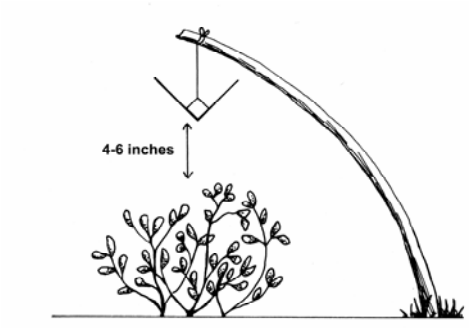
Scouting chart: blueberry diseases and insect pests



Use this table as a guide for when to begin scouting activities. Disease occurrence and insect emergence will vary slightly from year-to-year with weather conditions.

Tips for Scouting

Sweep net
Sample in a line with 10 semi-circle sweeps at different field locations -10-20 sets/10 acres



Field trap placement.

Tips for Scouting

Yellow-baited panel trap for maggot fly.

Place traps just above plants 100-200 ft. apart along wooded edges 25 feet from edge of fields, one trap per 10 acres.

A **10-20 x hand lens** will help to identify insects and diseases.

Thrips Monitoring

Blue sticky card for thrips monitoring and timing of insecticide application.

Tips for Scouting

Plant damage:

Defoliation in pruned fields

- often spanworm or flea beetle

Chewed or scalloped leaves

- often spanworm, sawfly or flea beetle

Skeletonized leaves

- leaf beetle

Shothole leaves

- strawberry rootworm

Curled leaves

- often thrips or gall midge

Bare patches:

spanworm, flea beetle, strawberry rootworm, herbicide damage

Dead or discolored stems/patches:

plant bugs, disease, nutrient deficiencies, herbicide damage

Tips for Scouting

Sampling for disease pressure

Use a **1'x1'** frame and count the number of blighted upright stems and blossoms.

Sampling leaf tissue at tip-dieback

(see leaf and soil nutrition section)

Blueberry at tip-dieback.

Tips for Scouting

- Collection bags or vials to hold samples for identification and clipboard for scouting forms and maps.
- Field maps to document locations of pest outbreaks and scouting efforts.
- Wire flags to mark areas of interest

Field maps available from county NRCS office or at http://maps.google.com/

Tips for Scouting

Assessment of pollinator activity

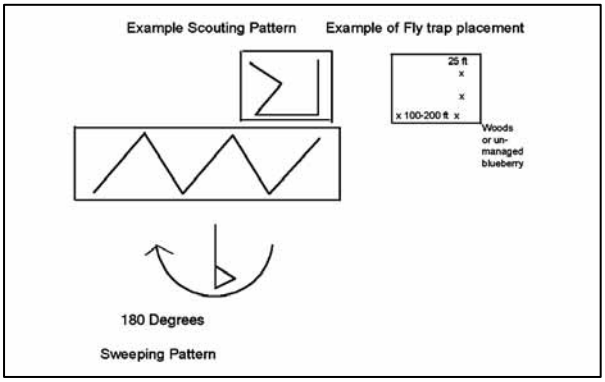
During full bloom, stake out 1-yard areas and count native and honeybees in that area for 1 minute at a time between the hours of 10 a.m. and 2 p.m. Stake out 8-10 of these per field.

Example of wire-sample frame.

When and Where to Sample

Sample representative locations, be sure to include:

- Edges (especially maggot fly) and interior of fields
- Random sites across the field
- Early morning, mid-day (bees) and late afternoon
- After a rain event

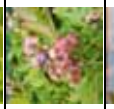


Walk in different areas of the field.

Lowbush Blueberry Growth Stages: Prune year

Emergence	Tip-dieback	Leaves red	Leaf drop and bud set
			
Early-mid May	Early-mid July	September-early October	October-November

Lowbush Blueberry Growth Stages: Crop year

Green tip	Leaf expansion	Early bloom	Full bloom	Green fruit	Fruit ripening	Fruit ripe
						
Mid-late April	May	Early-mid May	Late May-early June	Mid-late June	July	Late July-August

Diseases
Botrytis Blight *(Botrytis cinerea)*

The fungus *Botrytis* causes flower blight but may also infect leaves and stems. One week after infection, single blossoms or clusters turn light brown and develop a grayish-brown mold, which is easy to see with low powered magnification. In contrast to flowers that have not been pollinated, dead blossoms remain attached. Blossom blight may be distinguished from frost damage by the presence of the fungus on blossoms and by the lack of frost damage on other plants in the immediate area.


Bloom blight (left) and mold on flowers (right).

Severity Rating of *Botrytis* Infection Periods					
	Mean Temperature (°F) during Infection Period				
Wetness Duration (Hours)	39°	46°	54°	61°	68°
4	LOW	LOW	LOW	LOW	LOW
6	LOW	LOW	LOW	LOW	LOW
8	LOW	LOW	LOW	LOW	MED
10	LOW	LOW	LOW	LOW	HIGH
13	LOW	LOW	LOW	HIGH	HIGH
24	LOW	MED	HIGH	HIGH	HIGH
36	LOW	HIGH	HIGH	HIGH	HIGH
48	MED	HIGH	HIGH	HIGH	HIGH

Blossom Infection

LOW = 0-10%, MED = 11-41%, HIGH = 42-100%

- Monitor early clones, flowers become susceptible just prior to opening.
- Spray only when the rating is HIGH
- Use weather conditions to determine when to spray.

Diseases
Mummyberry *(Monilinia vaccinii-corymbosi)*

Initial symptoms: 2-3 weeks before full bloom affected leaves wilt and dry to a medium brown. On some leaves, only the center of the leaf may show reddish-brown symptoms. Infections can spread from leaves to twigs. From a distance, you can see a dead patch, similar to blossom blight or spanworm damage. Correct identification is essential for proper control.


Wilted brown leaves (left) and infected patch in blueberry field (right).

Mummyberry - *continued*

Second-stage symptoms: Cream-colored spores (conidia) produced at the base of diseased leaves are blown or carried by insects to blossoms and immature fruit. Infection spreads around the developing berry, which becomes a hard, shriveled, pumpkin-shaped, pinkish-gray sclerotium. Sclerotia survive the winter in the layer of fallen leaves and, if the soil remains wet long enough in the spring, these germinate to produce goblet-shaped apothecia.

Shriveled berries (left) and apothecia (right).

Severity Rating of *Monilinia* Infection Periods					
	Mean Temperature (°F) during Infection Period				
Wetness Duration (Hours)	36°	43°	50°	57°	65°
2	NONE	NONE	NONE	NONE	NONE
4	NONE	NONE	NONE	LOW	MOD
6	NONE	LOW	LOW	HIGH	HIGH
8	NONE	MOD	HIGH	HIGH	HIGH
10	MOD	HIGH	HIGH	HIGH	HIGH
15	MOD	HIGH	HIGH	HIGH	HIGH
24	HIGH	HIGH	HIGH	HIGH	HIGH

- If a frost has not occurred, risk is greatly reduced.
- Spray only when the rating is HIGH.
- Use weather conditions to determine when to spray.

Diseases
Red leaf (*Exobassidum vaccinii)*

Most leaves of affected plants are red to beet red. Some may appear normal, others may be partially affected with distinct irregular red blotch. Later in the season, a white layer of spores develops on the underside of the leaves. Few or no fruit develop, and some twigs may be killed. In the field, diseased stems often occur by themselves in clusters coming from the same rhizome. In some cases, the disease will appear in patches that may be a foot or more across.


White spores develop under leaves (left) and a patch of red leaf in a blueberry field (right).

Diseases

Witches broom (*Pucciniastrum oeppertianum)*

Symptoms: A broom-like mass of swollen stems. For crop and prune fields, monitor from emergence until the end of the season.

Blueberry stems affected by Witches broom.

Diseases
Leaf-spot (*Septoria* sp.)

Symptoms: Leaf lesions are small circular white to tan spots with purple borders. Leaf-spot diseases develop in June and can cause severe defoliation, which results in reduced vigor and yield.

Insects – **Insect Threshold Table**

Apply control only if threshold levels are reached.		
	Thresholds	
Insect Pests	**Crop fields**	**Prune fields**
Blueberry spanworm larvae	10/10 sweeps	5/10 sweeps
Flea beetle larvae or adults	50/10 sweeps	50/10 sweeps
Blueberry sawfly larvae	50/10 sweeps	50/10 sweeps
Strawberry rootworm adults	50/10 sweeps	50/10 sweeps
Leaf beetle larvae or adults	No established thresholds	
Red-striped fireworm larvae	No established thresholds	
Blueberry maggot fly	6 flies per trap per visit or a cumulative total of 10 flies per trap	

Apply control only if threshold levels are reached.		
	Thresholds	
Insect Pests	**Crop fields**	**Prune fields**
Blueberry thrips		Presence of thrips on trap -time to apply control

Add bees if observation levels are not met.	
Bees	**Crop fields**
Honeybees	2 bees / sq. yd / minute
Bumblebees	0.1 bees / sq. yd / minute
Native bees & honeybees	1 bee / sq. yd / minute

Insect Pests

Blueberry spanworm *(Itame argillacearia)*

Young, caterpillar larvae are about 1/8 inch long and dark gray to black with a series of white bands encircling the body. Fully grown larvae are an inch long and are yellowish-orange with rows of black spots that may look like continuous black strips running the length of the body.

Blueberry spanworm full grown larva (left) and adult moth (right).

Blueberry spanworm - *continued*

Damage may be confined to isolated areas or widespread. Large numbers of spanworm larvae may completely defoliate areas in both crop and pruned fields. Early in the season, larvae damage the berry crop by eating flower buds and blossoms. Later larvae chew notches out of developing leaves. The first sign of a severe infestation in a pruned field is an area devoid of or with slower developing shoots at ground level or below the soil surface.


Spanworm leaf damage (left) and bare patch due to spanworm feeding (right).

Insect Pests

Blueberry leaf beetle *(Pyrrhalta vaccinii)*

Adults range in color from brownish-yellow to reddish-brown. The larvae are light greenish-gray and are about 1/8 inch long when fully grown. Larvae and adults feed on underside of leaves and only between leaf veins resulting in a skeletonized appearance. These skeletonized leaves turn brown and look like the leaves have been burned. Found along field edges (larvae in spring, adults in early spring and late summer - fall). Target larvae or adults for control.

Blueberry leaf beetle larva (left) and adult (right).

Insect Pests

Blueberry sawfly *(Neopareophora litura)*

Adults are inch long, black, and generally wasp-like in appearance but do not have the narrow waist usually associated with a wasp. They have membranous wings which they hold flat over their body. The slow moving caterpillar-like larvae are usually the color of blueberry foliage, which makes them difficult to detect directly on foliage. Fully grown larvae are about 4/10 inch long. When feeding, young larvae feed in inner leaf whorl and leave black feces in whorl, full grown larvae coil their body over the edge of the leaf and chew around the edge, scalloping leaf edge. Control full grown larvae.

Blueberry sawfly larva (left) and adult (right).

Insect Pests

Strawberry rootworm *(Paria fragariae)*

Adults are shiny oval beetles, about 1/8 inch long. Their color varies from brown with four darker blotches on the back, to solid black. Although this insect is more commonly a pest of strawberries, when adults are abundant they will also feed on blueberry leaves. Leaves will be riddled with small holes giving the plants a ragged appearance. Target adults, monitor in early evening.

Strawberry rootworm adults.

Insect Pests

Blueberry flea beetle *(Altica Sylvia)*

Immature flea beetle is a small black larvae about 3/8 inch long when fully grown. Adult beetle is oval shaped, shiny, coppery bronze, and less than an inch long. Adult flea beetles tend to jump suddenly when disturbed. Larvae are present from late May through late June often over-lapping with bloom; cause scalloped leaves or complete defoliation. High densities cause bare spots in prune fields. Adults begin to emerge 2 weeks later and remain through late summer. Both larvae and adults can be targeted for control. Eggs can be targeted with burning.

Flea beetle larva (left) and adult (right).

Insect Pests

Blueberry thrips *(Frankliniella vaccinii & Catinathrips kainos)*

Thrips are very small, 1/8 inch long, and difficult to see. Thrips are more reliably identified by the presence of very tightly rolled-together leaves and twisted stems on blueberry plants beginning in late May or early June. Infested leaves often turn bright red and are quite conspicuous. Thrips damaged plants can be found in crop or pruned fields, but the most economically important damage is in pruned fields. Control emerging thrips in prune field just as shoots show green tissue or control fully formed curls with a delayed burn.


Thrips (left) and patch of curls (right).

Insect Pests

Tip midge *(Dasineura oxycoccana)*

Tip midge larvae are very small and not visible to the naked eye. A better way to identify this insect is through the loosely woven galls that are formed at the terminal ends of blueberry leaves. These galls are usually mistaken for thrips damage, but there are a few key differences. Tip midge galls are only formed at the terminal end of leaves, they will not encompass the entire stem. Leaves with tip midge galls are green in color, whereas leaves with thrips curls generally turn a bright red. Finally, tip midge galls are a more loose curl, whereas thrips curls are tightly rolled, almost like a cigar. Usually not considered too damaging.

Tip midge gall

Insect Pests

Red-striped fireworm *(Aroga trialbamaculella)*

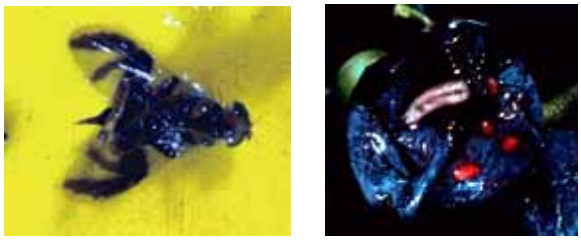
Young caterpillar larvae have a greenish body with darker heads. As they grow, reddish lines running the length of the body appear on the back and sides. Fully grown larvae are about 3/8 inch long and become very active when disturbed. They are found feeding between leaves that they have tied together with strands of silk. To identify fireworm damage, look for terminal leaves webbed together with silk in July. Target young hatching larvae prior to webbing or burn over wintering larvae in duff.

Red-striped fireworm larva (left) and webbed terminal leaves (right).

Insect Pests

Blueberry maggot fly *(Rhagoletis mendax)*

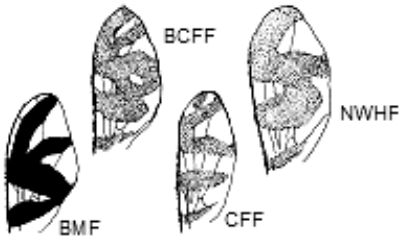
The female fly is about 3/16 inch in length with a wing span of approximately 1/3 inch. The female abdomen is pointed and black with four white cross-bands. The thorax is basically black with a small, backward-pointing, white projection. The two large compound eyes are reddish. The male fly is somewhat smaller than the female. The wings of both sexes are clear and are marked with characteristic black bands (need magnifier to see well). Adults or fly are the target of control.



Adult maggot fly (left), and maggot in fruit (right).

Blueberry Maggot Fly *- continued*

BMF can be found throughout the field but are in highest densities along edges of fields. There are three other species of fruit flies that can end up on the traps used to monitor for blueberry maggot flies: the black cherry fruit fly (BCFF), the cherry fruit fly (CFF), and the walnut husk fly (NWHF). These flies are distinguished by their wing patterns but they do NOT attack blueberries even though they are trapped in fields. The BMF has a continuous dark wing pattern. The BCFF has a small, oval, clear spot in the wing and the CFF's dark wing pattern is not continuous. The NWHF's wing pattern closely resembles that of the blueberry maggot fly. However, the walnut husk fly's wing pattern is not continuous, and the outer edge of the wing is black.



Insect Pests

Grasshoppers

Grasshoppers vary in color from greenish-yellow to gray to brown to brownish-black. The hind legs are large and adapted for jumping. All vary in size up to 1 1/4 inches long when fully grown. Immature grasshoppers are smaller and closely resemble adults but do not have wings. Both young grasshoppers and adults feed by chewing foliage and by biting and chewing on berries. Feeding damage is often detected later as a calloused scar on the fruit. Target young and adults. Mostly a problem in grassy fields.


Grasshopper (left) and feeding damage (right).

Insect Pests

Plant bugs

Plant bugs feed on the leaves of many plants, causing them to curl or spotting the leaves, reducing growth. They are considered a minor pest in blueberries. Not a source of economically important damage.

Plant bug.

Natural enemies
Wolf Spiders

Natural enemies are beneficial organisms that can provide some degree of pest control by eating or parasitizing pest insects. Promoting natural enemies may even provide suppression of minor insect pests. Maintaining a diversity of habitats, especially areas rich in flowering herbaceous plants and woody shrubs surrounding blueberry fields can promote natural enemies. When spraying insecticides, care should be taken to choose insecticides with low predator toxicity, and to spray only when necessary.

Wolf Spiders: generalist predators present all spring and summer in all parts of blueberry fields.

Natural enemies
Phalangids and **Common Ants**

Phalangids *(Phalangium opillio)* or **Daddy longlegs** is the most abundant species in blueberry fields and seem to favor agricultural habitats. They become more abundant towards the end of the growing season and are known to eat a wide variety of pest and non-pest arthropods.

Daddy longlegs

Example of common ant

Ants are recognized by constricted waist, elbow antennae, and wingless (except for reproductive stages). Common ant in many blueberry fields is the Allegheny mound ant.

Phalangids and **Common Ants** - *continued*

Ants: present from mid-May through the growing season. Many species (61) in Maine. Low insecticide input (i.e. organic) tends to result in higher numbers of ant colonies.

Allegheny ant mound.

Natural enemies
Ground Beetles and Parasitic Wasps

Ground beetles:
many species, some predacious, some eat weed seeds. Depending on the species, beetles are found in all parts of blueberry fields from May to August. Dark, black-brown in color.

Parasitic wasp specific to blueberry maggot fly (*Diachasma alloeum*).

Parasitic wasps:
two species specific to blueberry spanworm, at least one species specific to blueberry maggot fly. This species of parasitic wasp can parasitize up to 28% of BMF pupae. Most years, parasitism rates are closer to 3-10%.

Honey, Bumble, & Leaf-cutting Bees

Commercial options

Honey bees: The honey bee worker is about 3/4 inch in length and its color ranges from light brown to dark brown to almost black (there are various races and/or subspecies of honey bees in the U.S. such as Italians, Caucasians, Carniolans, and Africans with differing pigmentation). The large eyes are usually shiny black and the thorax (where the six legs and two pairs of wings are attached) is covered with a dense mat of brown hairs. The abdomen is long and quite often characterized by alternating light and dark bands or rings. It is uncommon now to have wild honey bees in Maine. Honey bees are the most common commercial pollinator due to the ability to stock fields with magnificent numbers (see Wild Blueberry Fact Sheet no. 629).

Commercial options *- continued*

Honey bee worker

Bumble bee worker

Bumble bees: Bumble bees are black and yellow or black and orange, hairy large bees and are quite unmistakable in appearance. There are several species (15) found in Maine. One species is managed for commercial pollination of blueberry, the impatient bumble bee (see fact sheet no. 302). For native species mostly queens are seen in blueberry fields. The smaller

Commercial options – *continued*

workers are mostly seen for the commercial species (see fact sheet no. 630). Bumble bees are the most efficient pollinators (on a per bee basis) and tolerate cold weather during bloom.

Alfalfa leafcutting bees: The alfalfa leafcutting bee is a good pollinator of wild blueberry. It is particularly suited for pollinating large, weed-free fields but is not tolerant of cold springs (see fact sheet no. 300).

Alfalfa leafcutter bee.

Native, Soil Nesting Bees

Native leafcutting and mason bees: These bees are native bees (family: Megachilidae) that are solitary (do not live in colonies like honey bees). The native leafcutter bees (more than a dozen species in Maine) live in cavities (hollow soft pith shrub and tree stems or in insect holes in tree trunks) and get their name from using leaves that they cut or mud that they collect to line their nest cavities. Most are small, bright metallic blue or black bees and can be increased in number by providing artificial nest blocks (see Fact Sheet No. 301).

Native leafcutting bee.

Native, soil-nesting bees - *continued*

Many solitary bees of the family Adrenidae (the sand bees or miner bees), nest in the soil by excavating tunnels and galleries to raise their young. Bees in the family Halictidae (sweat bees) usually nest in burrows in the soil, sometimes in rotting wood (see fact Sheet No. 630 for conservation tips).

Andrenid nest holes (left) and Andrenid bee (right).

Bottom left: Sweat bee

Weeds
Annual versus **Perennial Weeds**

Annuals germinate, set seed, and die within a single year. Roots are usually fine and net-like.

Perennials may live for many years. Roots are generally larger than those of annuals, and may help the plant to spread.

Structural characteristics of grasses, sedges, and rushes.

Grasses

Culm in cross section- hollow between nodes

Leaf blade, sheath, and culm

Cross section of flattened blade

Single seeded fruit (grain)

Seedling seen from above

Grasses, sedges, and rushes – *continued*

Sedges

Culm solid, in cross section- triangular in many sedges

V-shaped leaf near base or around culm

Leaves in 3's

Single seeded fruit

Seedling seen from above

Rushes

Culm in cross section- round usually with a solid pith

Leaf reduced to a basal sheath, no swollen nodes

Fruit a 3-chambered capsule, many seeds per capsule

Seedling seen from above

Weeds - Herbaceous Perennials

Goldenrod *(Solidago sp.)* (many species)	**New York Aster** *(Aster novi-belgii)*	**Black-Eyed Susan** *(Rudbeckia serotina)*	**Bunchberry** *(Cornus candensis)*
			
Flowering from July-October.	Many asters are found in Maine- they are herbaceous flowering perennials.	Flowers May to September.	Flowers mid May-June with wild blueberries

Weeds - Herbaceous Perennials

Braken Fern (*Pteridium aquilinum*)	**Interrupted Fern** (*Osmuda claytoniana*)	**Hay-scented Fern** (*Dennstaedtia unctilobula*)	**Purple Vetch** (*Vicia cracca*)
			
Reproduces by spores and creeping rhizomes (some up to 18' long).	Reproduces by spores and creeping rootstocks	Reproduces by spores and rhizomes.	Trailing flowers in July-August.

Weeds - Herbaceous Perennials

Low-running Blackberry (*Rubus lagellaris*)	**Wild Strawberry** (*Fragaria virginiana*)	**Common Cinquefoil** (*Potentillas implex*)	**Three-toothed Cinquefoil** (*Potentilla tridentate*)
			
Vine, flowers April-May.	Vine, flowers April-June.	Vine, flowers May-July.	Flowers June-August.

Weeds - Herbaceous Perennials

Dogbane (*Apocynum androsaemi-folium*)	**Hawkweed** (*Hieracium pratense*)	**St. Johnswort** (*Hypericum perforatum*)	**Sheep Sorel** (*Rumex acetosella*)
			
Flowers June-July.	Flowers June-July.	Flowers July-August.	Flowers May-September.

Weeds - Woody Perennials

Grey Birch (*Betula populifolia*)	**Alder** (*Alnus rugosa*)	**Willow** (*Salix spp.*)	**Red Maple** (*Acer rubrum*)
			
Slender tree with smooth white bark.	Small shrub 5' to 20' tall or a tree up to 40'.	Shrubs or trees With catkins in early spring.	Multi-stemmed bush in the open.

Weeds - Woody Perennials

Aspen, Poplar (*Populus tremuloides*)	**Sheep Laurel, Lambkill** (*Kalmia angustifolia*)	**Meadow Sweet** (*Spiraea latifolia*)	**Sweet Fern** (*Comptonia peregrina*)
			
Tree- leaves shake in the slightest breeze.	Flowers from June-July.	Erect, woody, shrub 2'-6' tall.	Flowering April-May. Woody shrub up to 3' tall.

Weeds - Woody Perennials

Rose (*Rosa virginiana*)	**Choke Cherry** (*Prunus virginiana*)	**Pin Cherry** (*Prunus pennsylvanica*)	**Nannyberry** (*Viburnum cassinoides*)
			
Thorny shrub up to 6' tall. Flowers May-July.	Flowers in May. Shrub or small tree 4’-20' tall.	Flowers April-June. Small tree up 35' tall.	Flowers May-June shrub up to 30'.

Weeds - Woody Perennials

Sugar Plum (*Amelanchier laevis*)	**Chokepear** (*Aronia melanocarpa*)	**Black Huckleberry** (*Gaylussacia baccata*)	**Rhodora** (*Rhododendron canadense*)
			
Flowers April-May. Large multi-branched shrub.	Flowers May-July.	Flowers July-August. Slightly taller than blueberry.	Woody shrub 1'-3' tall. Flowers appear before leaves in early spring.

Weeds - **Woody Perennials** and **Annual Grasses**

Bush Honeysuckle (*Diervilla lonicera*)	**Fall panicum** (*Panicum dichotomiflorum*)	**Witchgrass** (*Panicum capillare*)	**Colonial bentgrass** (*Agrostis apillaris*)
			
Flowering perennial shrub. Flowers May-June. Bush 2'-4' tall.	Summer annual with large round, smooth sheaths; often bent at nodes.	A densely hairy erect summer annual grass up to 32” height.	Grass fine leaf, very dense and light colored, 1 to 2’ in height

Weeds - Perennial Grasses

Quack-grass (*Elymus repens*)	**Bunch Grass** (*Andropogon scoparius*)	**Wild oat-grass** (*Danthonia spicata*)
		
Reproduces by rootstock and seed. Flowers from July-September.	Reproduces by seed. Flowers from August-October.	Reproduces by seed. Flowers from July-September.

Weeds - Sedges and Rushes

Pointed Broom Sedge *(Carex scoparia)*	**Three-square Sedge** *(Scirpus americanus)*	**Common Rush** *(Juncus effuses)*	**Wire-grass, Slender rush** *(Juncus tenuis)*
			
Perennial sedge. Reproduces by rootstocks and seed. Flowers July-September.	Perennial sedge. Reproduces by rootstocks and seed. Flowers June-September.	Perennial rush. Reproduces by seed. Flowers July-September.	Perennial rush. Reproduces by seed. Flowers June-September.

Sampling plant tissue for nutrient deficiency

Cut **3** stems from **30** clones throughout the field for one sample

- Do not include soil particles
- Do not mix in other vegetation
- Pesticide and dust residue must be rinsed off
- Store samples in a clean, dry area

Send samples to:
Analytical Lab, Room 407
The University of Maine
5722 Deering Hall
Orono, ME 04469-5722

Soil samples for pH level only

- Each sample box should contain a composite of at least 15 samples scattered over a well defined area.
- Take each composite sample from an area which is uniform with respect to texture, slope, drainage, erosion, color, or past soil management.
- Use a sampling tube, auger or spade. Take each sampling to a depth of 3-4 inches.
- Place the 15 samples of soil in a clean pail and mix thoroughly.
- Fill the sample box with the mixed soil for testing.

To obtain a sample box call (207) 581-3591 or contact your county Extension office.

Herbicide injury

Velpar

Too much Velpar causes blueberry plants to loose their leaves, starting at the bottom.

Herbicide injury

Roundup

Plants necrotic and then grow back stunted.

Herbicide injury

Surfactant

Plants defoliated in spots where surfactant or Crop Oil Concentrate (COC) is too high.

Abiotic

Drought injury

Plants dried out, usually in spots where soil is shallow.

Abiotic

Winter-kill injury

Tips of plants dead at uniform height. Injury may be uniform across field or in areas that did not have good snow cover.

Factors Affecting Pesticide Drift

Droplet size
Small droplets are more likely to move off target and so should be avoided. Small droplets move faster and give better coverage but can drift more and evaporate quickly.

Spray pressure
Lower pressure creates larger droplets and higher pressure creates smaller droplets.

Spray volume
Given the same pressure, nozzles with higher output produce larger droplets.

Wind
Make applications when winds are light to moderate with wind direction blowing away from sensitive areas.

Application speed
Faster speed of application increases shearing effect and produces more small droplets.

Spray angle
Nozzles with wide spray angles (110^0 or more) create smaller droplets than nozzles with narrower spray angles (80^0 or less).

Evaporation
On warm, dry days spray droplets evaporate more quickly and are more likely to drift. It is best to spray when RH is above 70%. RH below 50% may increase the chance of drift.

Temperature inversions
Occurs when cool air is trapped near the surface by warm air, droplets remain suspended for long periods of time and are easily blown off target by the wind. Happens when applications are made early in the AM when air is still cool.

Adjutants
Can increase droplet size and reduce drift but also may decrease the effectiveness if small drops are needed for coverage.

Low drift nozzles
Extended pressure nozzles maintain spay pattern at lower pressure and have less drift.

Estimating Wind Speed			
DESCRIPTION	**OBSERVED EFFECTS**	**NOTES**	**APPROXIMATE WIND SPEED**
Calm	Smoke rises vertically	Avoid fine sprays on warm sunny days	Less than 1 mph
Light Air	Smoke drift indicates wind direction; weather vanes do not move	Avoid fine sprays on warm sunny days	1 to 3 mph
Light Breeze	Leaves rustle; wind felt on face; weather vanes begin to move	Ideal spraying	3 to 7 mph
Gentle Breeze	Leaves and twigs in constant motion	Good spraying	7 to 11 mph

Estimating Wind Speed			
DESCRIPTION	**OBSERVED EFFECTS**	**NOTES**	**APPROXIMATE WIND SPEED**
Moderate	Small branches moved, raises dust, leaves, and loose paper	Avoid pesticides with finer sprays	12 to 15 mph
Fresh Breeze	Small trees sway	**DO NOT SPRAY** – Drift regulations prohibit spraying when wind speed is over 15 mph	
Strong Breeze	Large branches sway	Off target movement very likely	
Moderate Gale	Whole trees in motion		