



Pest Management Strategic Plan for Grapes in the Northeast 2017

Northeastern
IPM
Center

Pest Management Strategic Plan for Grapes in the Northeast 2017

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Key Pest Name Abbreviations

Insects

GP = Grape Phylloxera (*Phylloxera vitifoliae*)

JB = Japanese Beetle (*Popillia japonica*)

GBM = Grape Berry Moth (*Paralibesia viteana*)

Diseases

DM = Downy Mildew (*Plasmopara viticola*)

PM = Powdery Mildew (*Erysiphe necator*)

BR = Black Rot (*Guignardia bidwellii*)

Bot = Botrytis (*Botrytis cinerea*)

PH = Phomopsis (*Phomopsis viticola*)

Weeds

Pre = Pre-emergent Weeds

Post = Post-emergent Weeds

Executive Summary

In the Northeast, grapes are an important established crop in New York, Pennsylvania, and portions of New Jersey; they also are an emerging and expanding crop in southern portions of the NE region such as Maryland and throughout the New England states, where the introduction of new cold-tolerant cultivars now allows production in regions where low winter temperatures previously precluded cultivation of this crop. Grapes have become particularly popular in these new regions because they can provide growers opportunities with value-added wine production and unique agritourism offerings. The expansion of grape production into regions where there is little experience with this crop or extension infrastructure dedicated to its support entails an additional set of challenges for new growers.

A Grape Strategic Pest Management Plan (PMSP) has never been developed in the Northeast. A diverse stakeholder group of Northeast growers, researchers, organic association technical personnel, IPM practitioners and extension specialists were gathered to develop a Northeast Grape PMSP that accurately reflects the current insect, weed and disease problems in Northeast grapes and the IPM management strategies for those pests. Prior to the 2016 Grape PMSP meeting participants were asked to list the key pests, diseases and weeds in order of importance in grape. This survey was substituted as a cost-effective and efficient replacement for a Crop Profile and Survey. The list of key pests for grape included three insects, five diseases, and the weeds and vertebrates common in agricultural settings. The key pests are typically persistent problems that need to be managed every year.

Of special note, there are other current and emerging pests that annually affect the crop to lesser degrees but can be damaging when outbreaks occur. The impact of direct damage from Spotted Wing Drosophila is still being assessed but awareness of potential threat is high and there is an educational need for management decision knowledge and planning. Anthracnose and Crown Gall occurrences are increasing. There is a need for research to increase understanding of biology and management of these diseases as well as for Trunk Dieback and Sour Rot complexes.

This PMSP addresses all grapes grown in the NE region: interspecific hybrid cultivars, including the new cold-climate varieties used for wine and table grape production; *Vitis vinifera* cultivars that form the backbone of the premium-wine segment of the industry; and *V. labrusca*-based “native” cultivars, used for unfermented grape products, traditional sweeter wines, and table use. In addition to providing an in-depth educational opportunity for those participating in the development of the PMSP, the group also identified critical priorities that can be used to develop a plan for future research, extension and regulatory needs for grapes in the Northeast.

Critical Needs

Research

- There is a continued need for research of new materials and understanding of the balance of materials and labor.
 - There is constant movement towards low input vineyard management, including organic materials and methods.
 - There is an overall preference for non-restricted, less toxic management materials; new growers are not necessarily certified to use restricted-use materials.
 - Adapt management program to crop; vinifera require more management material applications than do hybrids than do juice grapes.
 - Wine grape growers are at high economic risk when avoiding management applications whereas juice grape growers cannot afford management applications that will compromise small economic margins and encourage surplus crop.
 - Management decisions in vineyards integrated with wineries are ultimately tied to how much of the fruit is used in the winemaking process and marketability of the wine.
- Maintenance of weather stations is important to the use of NEWA (Network for Environment and Weather Applications) models (temperature, humidity, cloudiness).
 - Develop more NEWA models for grapes that are more predictive and sophisticated.
- There is a research need to focus on perennial diseases that are not immediately a problem but may build up to reduce crop over time; annual diseases are well understood.
- Explore integrating Black Rot management into organic and/or reduced-spray programs (specific sanitation recommendations, demo plots, cordon renewal).

Regulatory

- There is a need for multi-state specialists in weeds, viticulture, and enology.
 - There are not enough specialists in each state available to develop programming for the grape industry.
- There are regional differences within the Northeast in management issues and needs; growers need to know where to find resources tailored to different regions.

Education

- New grower education programs (identification, life cycles, spray timing, crop updates, rational decision making) could make a big difference in disease management.
 - Beginning growers have different educational needs than experienced growers and there is a big learning curve.
 - Regular, continuous, simplified information delivery may be necessary to avoid information overload that often occurs during intensive workshops.
- More experienced growers need more advanced information; it may be necessary to split programs between new and experienced growers.
 - Explore new delivery methods (web broadcast, online, live) with multistate potential.
 - Develop guides with stepwise complexity for different experience levels.
- There is interest in small, portable guides for identification of fruit and foliar diseases with pictures of key pests.

I. Introduction

Background of Grape in the Northeast

In the Northeast, grapes are an important established crop in New York (39,216 acres), Pennsylvania (12,415 acres), and portions of New Jersey (1,082 acres) (USDA NASS, 2012). They also are an emerging and expanding crop in southern portions of the NE region such as Maryland and throughout the New England states, where the introduction of new cold-tolerant cultivars now allows production in regions where low winter temperatures previously precluded cultivation of this crop. According to a 2014 NASS report where grapes were singled out as a crop for the first time in New England, there were 900 acres of grapes grown in New England yielding an average of 2.5 tons/acre (USDA NASS, 2015). The value of the utilized production for the area was \$4,200,000, resulting in an average of \$4,666 per acre. Some states have seen a doubling (ME, NH) or tripling (VT) of acreage reported in the 2012 Ag Census compared with the 2007 Census (USDA NASS, 2012). The reasons for this recent significant expansion include the economic opportunities that valued-added wine production offer plus the opportunity to capture agritourism markets through vineyard and winery tours. The 'buy local' movement has significantly fueled the demand for locally-produced wines and table grapes and the interest in developing the crop continues to increase. In many of the states, this has been an exciting opportunity for new and young growers. Every state in the Northeast region have incorporated 'Wine Trails' in marketing brochures and have successfully attracted both local and out of state visitors resulting in increased grower, winery and state income through these tourism efforts.

Grapes can be difficult to grow in the humid Northeast and the complex of fungal diseases are particularly challenging and include black rot (*Guignardia bidwellii*), Phomopsis (*Phomopsis viticola*) cane and leaf spot, powdery mildew (*Erysiphe necator*), downy mildew (*Plasmopora viticola*), anthracnose (*Elsinoe ampelina*) and Botrytis (*Botrytis cinerea*) bunch rot among others. Grapes are also attacked by variety of pests, including grape berry moth (*Paralobesia vitieana*), potato leafhopper (*Empoasca fabae*) and Japanese beetle (*Popillia japonica*). With increased movement of insects, diseases, plant materials, and invasive weeds, in addition to the pressures of climate change, the scope of pests and diseases causing problems in grapes is continually changing and expanding. Spotted wing drosophila (*Drosophila suzuki*) and brown marmorated stink bug (*Halyomorpha halys*) are new and emerging pests in the Northeast that could potentially impact production (Koehler, G., 2011, Jacobs, S., 2010). Deer and birds also cause significant damage along with mites, virus diseases and weeds. The development of new bio-rational and conventional pesticide materials along with the loss of key pesticides due to regulatory action, the development of resistant pest populations, and ever changing market conditions also present ongoing challenges in pest management strategies even for experienced growers. Furthermore, the expansion of grape production into regions where there is little experience with this crop or extension infrastructure dedicated to its support entails an additional set of challenges for new growers of such a pest management-intensive crop.

There has never been a Grape PMSP produced for the Northeast, although in 2000 Grape Crop Profiles (Vinifera and French Hybrid, Labrusca) addressing pest and disease management were developed by Cornell in response to the 1996 Food Quality Protection Act (Weigle et al., 2000a, Weigle et al., 2000b). After speaking with two of the authors, Dr. Wayne Wilcox and Tim Weigle, both indicated these Crop Profiles "desperately needed updating" and asked that western/central New York should be included in proposed PMSP. Wilcox also indicated a Grape PMSP would be of interest to those in the Midwest and North Central regions. (Wiegle, Pers. comm., 2016; Wilcox, Pers., comm., 2016).

How this plan was created

A diverse review group of Northeast grape growers, researchers, organic association technical personnel, IPM practitioners and extension specialists met for two days in November of 2016 to develop the Pest Management Strategic Plan (PMSP) following the guidelines as outlined on the Northeast IPM Center website under 'PMSP checklist' at http://www.ipmcenters.org/pmsp/PMSP_CHECKLST.pdf and 'PMSP revisions' at <http://www.ipmcenters.org/pmsp/PMSPRevisionGuidelines.pdf>.

Key pests driving pesticide use were identified from a survey of participants prior to the meeting (see note). Seven participants responded, representing six participating states. Key pest summaries and currently registered pesticides for each key pest were adapted from previous Crop Profiles, the *2016 New York and Pennsylvania Pest Management Guidelines for Grapes*, the *2015-2016 New England Small Fruit Management Guide*, and the *Compendium of Grape Diseases, Disorders, and Pests, Second Edition* with input from participants. Information was updated following the meeting to include the *2017 New York and Pennsylvania Pest Management Guidelines for Grapes* (NYPA Guide) and the *2017-2018 New England Small Fruit Management Guide* (NESFMG) (<http://www.nysipm.cornell.edu/guidelines.asp>, <https://extension.umass.edu/fruitadvisor/ne-small-fruit-management-guide>, <http://www.apsnet.org/apsstore/shopapspress/Pages/44792.aspx>).

The group took a pest by pest approach and identified current pest management strategies that included both chemical (conventional and organic) and cultural methods. With each pest, the group discussed the efficacy, practicality, advantages and disadvantages of the current pest management methods; identified at-risk pesticides for key pests; identified acceptable alternative pest management methods and created lists of research, regulatory and education priorities needed to improve pest management outcomes while minimizing reliance on pesticides.

Points made in this discussion were recorded as table and list entries to create the draft Pest Management Strategic Plan document. The draft document was reviewed by meeting participants and by other Northeast University and private sector experts for accuracy and completeness. At least one person in each Northeast state reviewed the draft PMSP and approved it as representative for their state.

NOTE: In the past, the PMSP was typically done after a crop survey and crop profile, but to save time and money, the process was streamlined and limited to the PMSP. Each participating specialist is well versed in the insect, weed and disease issues in grapes and pest management options in his or her state. University of Vermont has played the lead role in development and delivery of all previous Northeast PMSPs based on small fruits (Hazelrigg, et al., 2015; Hazelrigg, et al., 2010; Hazelrigg, et al., 2007; Hazelrigg, et al., 2006). The 2000 Crop Profiles were referenced but not used as a basis for development of this PMSP (Weigle et al., 2000a; Weigle et al., 2000b).

Benefits to the Northeast Grape Industry

Pest Management Strategic Plans have been long recognized as a valuable conduit for researchers, growers, IPM practitioners and extension to communicate with regulators and granting agencies. Through the PMSP process growers, researchers, extension and other IPM practitioners also identify critical priorities in research, extension and regulation that researchers and extension personnel use to drive critical grant and research requests for future work. The PMSP process also identifies gaps in knowledge of pests and management strategies that can be addressed in newsletters, at future grower meetings and through site visits with growers.

This Grape PMSP will benefit growers, state Grape and Wine Associations, researchers, organic growers and grower associations, extension personnel, IPM practitioners and other stakeholders, who are working with grapes in the Northeast region. This PMSP will also be relevant and beneficial to grape stakeholders in the Midwest and North Central region and will be shared with colleagues in those regions through the IPM Centers. A current and accurate Grape PMSP is an essential tool for stakeholders and will be used to direct successful pest management decisions based on IPM strategies. The Grape PMSP will also provide a catalyst for researchers to help secure future grant funding and research to benefit grape growers. This PMSP will be valuable to extension specialists to identify educational gaps in knowledge and to develop and provide topics to be presented throughout the region through meetings, newsletters, websites and site visits on pests and pest management strategies for grapes.

The members of the Small Fruit IPM Working Group find PMSPs capture a realistic and extremely valuable snapshot of the pest issues and management strategies for a specific crop. Several in the Small Fruit IPM Working Group mentioned they find listing cultural, organic and conventional pest management strategies for one crop in a thorough document like a PMSP very helpful when working with growers. The Small Fruit IPM Working Group listed “Updating Pest Management Strategic Plans (PMSP)” as the top priority for the Northeast region in our 2012 and 2013 meetings. The Working Group identified a Strawberry PMSP as the first to be addressed (<http://www.Northeastipm.org/neipm/assets/File/Strawberry-PMSP-2015.pdf>), followed by a Grape PMSP. See list of priorities compiled by the Small Fruit IPM Working Group for 2013 in at <http://www.Northeastipm.org/neipm/assets/File/Priorities/Priorities-SmallFruitIPMWG-2013.pdf>

II. Summary

Key Grape Pests Summary

Insects and Mites

Grape Phylloxera (*Phylloxera vitifoliae*)

- Heavily infested leaves may fall prematurely, retard shoot growth, and decrease vine vigor or vine death if roots are heavily infested.
- Manage before bloom when first galls are detected and again 10 to 12 days later if new growth becomes infested. Galls appearing before bloom will decrease crop quality. Once canopy has developed 1-2 weeks past bloom and fruit set, then damage is largely cosmetic.
- Huge differences in varietal susceptibility. Serious losses can occur in own-rooted susceptible varieties (vinifera). Loss by the root feeding form can be substantially reduced by grafting to a phylloxera-resistant rootstock. Varieties developed through breeding programs in areas with native *Phylloxera* (e.g. University of Minnesota) have tolerance to this pest.
- Endemic presence is assumed; most growers use resistant varieties and have high tolerance for this pest. Severity varies from year to year. Increasing population in some areas, possibly due to mild winters (Connecticut).

Japanese Beetle (*Popillia japonica*)

- Damage is caused by direct feeding by adults on the leaves. Damage is mostly cosmetic in vigorously growing vines. Adult insects may contaminate clusters in earlier harvested varieties such as table grapes. Adults are highly mobile and may originate outside the vineyard.
- Management begins after adult beetles appear in early to mid-July.
- Many available materials are effective; one application is often sufficient if needed; cost and environmental considerations are the determining factors in material selection. Pheromone traps are not effective. Treating larvae in vineyard turf is not effective.
- Excessive foliar feeding in newly planted vineyards can result in delayed root and canopy development resulting in a delay of one year or more in terms of full crop production; which potentially could lead to removal of the vineyard. Infestations have a larger impact on smaller acreage vineyards.
- Turf between vines and use of grow tubes on young vines may increase pest populations. Grow tubes are not recommended if this pest is present.
- Cultivars vary in susceptibility.

Grape Berry Moth (*Paralibesia viteana*)

- Direct feeding by larvae on clusters during the bloom period. After berries have developed, larvae enter berries and feed within. Late season feeding results in damage to multiple berries per cluster.
- Management is determined by using established risk assessment models that utilize biofix and phenology and by scouting for adults. Timings could include; immediate post bloom, first week in August and first week in September. Models improve application timing against second generation.

- Timing varies with different materials. Mating disruption products are effective but rarely used. Resistance developed to Sevin in the Lake Erie region has prompted a switch to other products (Danitol, Provado, imidacloprid, etc.).
- Cluster infestation at harvest is not uncommon and complete crop loss can occur. Tight cluster, rot susceptible varieties are likely to have higher infestations. Crop loss is higher near the edge of vineyards and dependent on surrounding habitat. Secondary fungal infection can seriously affect wine quality.
- Federal inspection standards make this a key insect of juice grapes.
- Insect presence is increasing in the upper New England states.

Diseases

Downy Mildew (*Plasmopara viticola*)

- Berries, leaves and young shoots can be infected. This can result in a loss of growth with early season shoot infection, premature defoliation with leaf infections and direct crop loss through berry infections. End of season defoliation impacts overwintering.
- Management occurs at 10-inch shoot growth through harvest, depending on frequency of early season rainfall, varietal susceptibility and overwintering inoculum.
- Endemic presence is assumed and managed for; huge issue on susceptible varieties, still an issue on less-susceptible varieties; 'La Crescent' most susceptible of cold-hardy varieties.
- Yield loss can be up to 100% if early season infections to shoots, leaves and /or clusters are not managed.

Powdery Mildew (*Erysiphe necator*)

- The fungus can infect all green tissues of the grapevine. Expanding leaves that are infected become distorted and stunted. Cluster infection at bloom may result in poor set and considerable crop loss. Infection when berries are pea-size or larger may result in split berries. Infection when berries begin to ripen may cause purple or red cultivars to fail to color properly and have a blotchy appearance at harvest. Such fruit will produce wines with off flavors.
- Management occurs at 1-inch shoot growth for highly susceptible varieties or problem areas if rain and temperatures above 50°F are predicted, and continue through late summer.
- Huge differences in varietal susceptibility.
- Unless there are secondary markets for the crop, yield loss can be up to 100% when severe, early season infections occur, rendering the fruit unmarketable for wine due to the off flavors the infected berries can transfer to the wine.

Black Rot (*Guignardia bidwellii*)

- This disease is one of the most serious diseases of grapes in the eastern United States and can cause substantial crop loss under the appropriate environmental conditions. All green tissues of the vine are susceptible to infection.
- Disease severity the previous year and varietal susceptibility to black rot and weather are the major factors in determining how early protection is required. Critical management window is immediate pre-bloom through 3-4 weeks (Concord) or 4-5 week (vinifera) post-bloom. Under

heavy disease pressure protectant applications may begin as early as 6-10 inch shoot growth on susceptible varieties.

- Most difficult pest to manage organically; common problem for homeowners due to lack of available materials; some differences in varietal susceptibility.
- Yield loss can be up to 100% in years of frequent early rainfall that favors development of primary infections.

Botrytis (*Botrytis cinerea*)

- Not a problem for juice varieties and some wine varieties.
- Causes bunch rot of clusters and may blight blossoms, leaves, and shoots. Bunch rot can cause severe economic losses, particularly on tight-clustered cultivars. Ripe berries are susceptible to direct attack and are particularly susceptible to infection through wounds caused by insects, hail, or cracking. Infections can spread rapidly throughout the cluster, causing withered and rotted berries.
- Integrated (nutrients, canopy, site selection, fungicides) management is critical for successful disease management. A combination of the following management timings occur: 50% bloom (in wet seasons) and prior to bunch closure. This depends on variety, disease history and weather conditions.
- Fungicides labeled for Botrytis have all been shown to be extremely prone to resistance development.
- Yield loss can be up to 100% due to berry infection.

Phomopsis (*Phomopsis viticola*)

- All green tissues of the vine are susceptible to infection. Severely infected leaves are misshapen, yellow, and fall from the vine prematurely. Infected rachises are brittle so portions of the cluster may fall off before harvest. Infected fruit are discolored and can drop to the ground before maturity.
- Most likely to become a problem when the fungus is allowed to build up on dead canes in the vines, especially if weather is wet during critical stages of disease development. Mechanically pruned vineyards are at particular risk of incurring economic losses.
- The critical management period for development of the cane and leaf spot phase of the disease starts at 1-inch shoot growth through the first few weeks of growth. Management for cluster and rachis infection occurs from the time clusters first become visible until after pea-sized berries are formed. Cane pruning on high cordon trained vines and scheduled renewal of cordons and trunks is recommended.
- Increasing occurrence in region as new vineyards age (old wood, inoculum build up, warmer earlier in season).
- Yield loss can be up to 40% when incidence of the disease is high.

Weeds

Annual Grass Weeds

Annual Broadleaf Weeds

Perennial Grass Weeds

Perennial Broadleaf Weeds

- Weed infestations occur in mixed populations including annual grasses, annual broadleaf, perennial grasses, perennial broadleaf, woody perennial and vine weeds. Weed populations vary across regions and vineyards.
- Excessive weed pressure impacts plant development and productivity by competing with the crop for water, light, and nutrients. Weeds serve as habitat for small vertebrate pests such as voles and mice that may girdle vines. Weeds can inhibit spray penetration, air circulation, and drying conditions.
- High-yield juice varieties (Concord) perform better with bare ground under vines.
- Maintaining weed free areas under wine grape vines is not practical in Northeast climate and vegetation under vines is becoming more common. Vineyard floor vegetation may be used to regulate vigor; will compete with vines for water in drought years. Vineyard floor vegetation is commonly managed by mowing or cover crops.
- Management with pre-emergence and post-emergence herbicide applications under vines is common, often targeted against specific weeds. Mowing is typical for row-middle management. Bloom to fruit set is the critical period to manage weed competition. Weeds may be more tolerated later in the season.
- New plantings should be managed to remove all weeds during establishment years. Mature plantings may tolerate weeds. Bearing and non-bearing vines may tolerate different management.
- Grow tubes are strongly recommended to protect vines during herbicide applications.
- Grapes are very sensitive to herbicides; drift from neighboring applications (golf courses, turf, 2,4-D and dicamba tolerant soybeans, etc.) pose a hazard to vineyards.
- Yield losses are very difficult to quantify.

Vertebrate and other pests

Vespid (*various species*)

- Wasps, hornets, yellow jackets, honey bees
- Feeding damage breaks skin of fruit, loss of juice, provides opening for rot, yellow jackets, other fruit flies. Stinging hazard to workers handling fruit.
- Hot dry years increase activity.
- No materials are labelled for wasps during harvest.

Birds (*various species*)

- Starlings, other songbirds, turkeys
- Feeding damage strips fruit; feces contaminates fruit, spreads weed seeds.
- High cordon training systems provide attractive perch above vines and fruit.
- Netting is the primary prevention technique, usually only necessary for a short period prior to harvest; early deployment creates a challenge when spraying; labor and materials are expensive; tight netting will also keep out JB.

- Inflatable scarecrows and other scare devices must be moved around and changed regularly to remain effective; propane cannons can be vary irritating, should be shut off at night, and police notification may be necessary to offset noise complaints.

Whitetail Deer (*Odocoileus virginianus*)

- Feed heavily on plants if not fenced out.
- Fencing is the most effective management method; taste/odor repellants may be effective (thiram, Hinder, Liquid Fence).
- Dogs in vineyard may deter; training available to keep wildlife out of sensitive areas.

Mice and Voles (*Peromyscus sp*, *Microtus pennsylvanicus*, *Microtus pinetorum*)

- Girdle vines in winter. Minor problem in most vineyards.
- Some varieties are highly preferred. Younger vines are more vulnerable.
- Groundcover under vines provides habitat.

Raccoon and Opossum (*Procyon lotor* and *Didelphis virginiana*)

- Climb into vine canopy, feed on ripe fruit.

Coyotes and Foxes (*Canis latrans* and *Vulpes vulpes*)

- Chew irrigation; eat clusters.

Specific Pest Management Tactics Summary

Insecticides –Key Pest(s)

IRAC = Insecticide Resistance Action Committee (with mode of action classification code)

OMRI = Organic Materials Review Institute

Key Pest Name Abbreviations = see page 3

acetamiprid (Assail) –GP, JB

IRAC 4

- Less expensive than Movento (spirotetramat) for GP
- Requires repeat applications for GP
- Movento (spirotetramat) is the preferred material for GP
- Useful in multiple crops against leafhoppers
- Longer lasting systemic
- Also effective against leafhoppers and some activity against beetles

***Bacillus thuringiensis* (Biobit, Dipel, Deliver) -GBM**

IRAC 11

- Can be used successfully
- Proper timing is critical
- Repeat application required
- OMRI certified

beta-cyfluthrin (Baythroid) –JB, GBM

IRAC 3

- No comments

bifenthrin (Brigade) –JB, GBM

IRAC 3

- No comments

carbaryl (Sevin) –JB, GBM

IRAC 1

- Inexpensive
- Immediately effective
- Regular monitoring
- May need additional applications
- Can flare mite population
- Resistance developed in Lake Erie region
- Most commonly used material
- Not restricted use

chlorantraniliprole (Altacor) –JB, GBM

IRAC 28

- No comments

dinotefuran (Venom, Scorpion) –GP, JB, GBM

IRAC 4

- Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves
- Label only suppression for GP
- Neonicotinoid
- Also effective against sucking insects
- Not in NESFMG for GP, JB

fenpropathrin (Danitol) –GP, JB, GBM

IRAC 3

- Application timing critical for GP; must target GP crawler stage
- Not a neonicotinoid
- Harmful to natural enemies
- Restricted use
- Toxicity warning label

flubendiamide (Belt) –JB, GBM

IRAC 28

- Not in NYPA guide for JB

flubendiamide + buprofezin (Tourismo) -GBM

IRAC 28+16

- No comments

imidacloprid (Admire Pro, Provado, Leverage, Pasada) –GP, JB, GBM

IRAC 4

- Timing different for soil application for GP = reactive to previous year
- Can also be foliar application for GP
- Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves
- Systemic

imidacloprid + bifenthrin (Brigadier) –JB, GBM

IRAC 4+3

- Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves
- Not in NESFMG

indoxacarb (Avaunt) –JB, GBM

IRAC 22

- Longer lasting systemic

methoxyfenozide (Intrepid) -GBM

IRAC 18

- Effective; good success

- One application timed with NEWA model
- Insect growth regulator

phosmet (Imidan) –JB, GBM

IRAC 1

- Long re-entry interval (14 days)

potassium salts of fatty acids (Des-X, M-Pede) –GP, GBM

IRAC UN,0

- Hard to imagine they work on GP
- Organic growers don't worry about GP
- Not in NYPA guide
- OMRI certified

pyrethrins + piperonyl butoxide (Evergreen) –JB, GBM

IRAC 27+3

- Not in NESFMG
- OMRI certified

spinetoram (Delegate) -GBM

IRAC 5

- Less expensive than Entrust
- Related to Entrust
- Not organic

spinosad (Entrust) -GBM

IRAC 5

- Effective
- More expensive than Delegate
- SWD reserve, especially organic growers
- Not in NESFMG
- OMRI certified

spirotetramat (Movento) -GP

IRAC 23

- Very effective
- One application before bloom
- More expensive than Assail
- Systemic
- May be economically feasible for Concord growers to use against the root form

thiamethoxam (Platinum, Actara) –GP, JB

IRAC 4

- Soil applied for GP
- Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves

- Neonicotinoid

thiamethoxam + chlorantraniliprole (Voliam Flexi) -GP, JB, GBM

IRAC 28+4

- Foliar application for GP
- Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves
- Neonicotinoid
- Also effective against other Lepidopterans and leafhoppers

zeta-cypermethrin (Mustang Max) –JB, GBM

IRAC 3

- No comments

Fungicides, Bactericides –Key Pest(s)

FRAC = Fungicide Resistance Action Committee (with mode of action classification code)

OMRI = Organic Materials Review Institute

Key Pest Name Abbreviations = see page 3

ametoctradin + dimethomorph (Zapro) -DM

FRAC 45+40

- Highly effective
- Expensive
- New material
- Label only for DM on grape

***Aureobasidium pullulans* (Botector) -Bot**

FRAC na

- Among the more effective organic options
- Living fungal organism; sensitive to fungicide use against other diseases
- Limited efficacy
- OMRI certified
- Newer material

azoxystrobin (Abound, Azaka, Quadris) –DM, PM, BR, Bot, PH

FRAC 11

- Highly effective for DM and BR;
- Highly effective in the absence of resistance for PM
- Poor efficacy for PH
- Label only suppression for Bot
- High resistance risk for DM, PM and risk for Bot; no longer used for DM in intense growing regions; still used for PM in combination products with effective materials
- Resistance develops rapidly for DM and PM; undetected until after develops
- Should combine with another material to reduce resistance risk for DM and PM
- Primarily protective for BR; little post-infection activity for BR
- Post-bloom fruit rot use only for PH; not recommended for early season use for PH

- Rainfast
- Expensive
- Potential drift issues; highly phytotoxic to some apples

azoxystrobin + difenoconazole (Quadris Top) –DM, PM, BR, Bot, PH

FRAC 11+3

- Combination product
- Both ingredients highly effective for BR
- Protective and post-infection activity for BR
- Very effective for PM
- Only active ingredient against DM is azoxystrobin
- Rates used not active for Bot (difenoconazole activity)
- No data to support efficacy of difenoconazole for PH
- Resistance risk for DM, PM and Bot
- Post-bloom fruit rot use only for PH
- Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity)
- Potential drift issues; highly phytotoxic to some apples

***Bacillus amyloliquefaciens* (Double Nickel) –PM, Bot**

FRAC 44

- Limited efficacy
- OMRI certified

***Bacillus pumilis* (Sonata) –DM, PM, Bot**

FRAC 44

- Poor efficacy for DM, Bot
- Limited efficacy for PM
- OMRI certified
- More likely effective under low pressure or with resistant varieties

***Bacillus subtilis* (Serenade) -Bot**

FRAC 44

- Limited efficacy
- Not in NYPA guide
- OMRI certified

boscalid (Endura) –PM, Bot

FRAC 7

- Effective
- Moderate resistance risk
- Pristine preferred at similar price with broader spectrum

boscalid + pyraclostrobin (Pristine) –DM, PM, BR, Bot, PH

FRAC 11+7

- Effective for PM; especially where pyraclostrobin alone is no longer effective
- Highly effective for BR

- Effective for Bot; potential for modest pyraclostrobin contribution for Bot
- Poor efficacy for PH
- Post-bloom fruit rot use only for PH; not recommended for early season use for PH
- Wide spectrum activity; broader spectrum than boscalid (Endura)
- Only active ingredient against DM and BR is pyraclostrobin
- Only active ingredient against PM and Bot is boscalid
- Resistance risk for DM; Resistance common (pyraclostrobin) for Bot
- Resistance management provided by combination pertains only to PM
- Long, confusing re-entry interval for some tasks
- Rainfast
- Expensive
- Phytotoxic to some hybrid and native varieties (not used on Concord for Bot)

captan (Captan, Captec) –DM, BR, Bot, PH

FRAC M4

- Broad spectrum
- No resistance concerns
- Inexpensive
- Only moderately effective for BR
- Poor efficacy for Bot
- Effective for PH
- A standard material for PH
- Long re-entry interval
- Restrictions by juice grape processors, sale to Canada
- Severe phytotoxicity possible when mixed with oils (increased absorption)
- Application temperature restrictions
- Under scrutiny by EPA

copper, fixed (Champ, C-O-C-S, Kocide) –DM, PM, BR, PH

FRAC M1

- Effective for DM
- Modestly effective on Concord and native varieties for PM
- Poor efficacy on vinifera varieties for PM
- Most effective current OMRI certified materials for BR and PH
- Only moderately effective with short spray intervals for BR
- Modest activity for PH
- Broad spectrum
- No resistance concerns
- Phytotoxic to some varieties (increased absorption)
- Phytotoxicity increases with cool, slow drying conditions (increased absorption)
- Accumulation in soil may eventually become toxic (Europe)
- OMRI certified (certain formulations)
- Lifetime limit on applications in dairy industry

copper sulfate + lime (Bordeaux mix) –DM, PM, BR, Bot, PH

FRAC na

- Difficult to blend
- Not in NYPA guide
- Fixed coppers are easier to use
- OMRI certified

cyazofamid (Ranman) -DM

FRAC 21

- Good efficacy
- Multiple crop use
- Rotation option
- Protective only
- New FRAC group; only material in category
- Not much product information
- Label only for DM on grape

cyflufenamid (Torino) -PM

FRAC U6

- Good efficacy
- Good for rotation
- Not as effective as other materials
- New FRAC group; only material in category

cyprodinil (Vanguard) -PM, Bot

FRAC 9

- Very good efficacy for Bot; protective and post-infection activity
- No significant activity against other diseases
- Label only suppression for PM
- Moderate to high resistance risk
- Expensive

cyprodinil + difenoconazole (Inspire Super) –PM, BR, Bot, PH

FRAC 3+9

- Good efficacy for PM, BR, and Bot
- Poor efficacy for PH; Not recommended for PH
- Most active among FRAC 3 materials for PM
- Only active ingredient against BR is difenoconazole
- Only active ingredient against Bot is cyprodinil
- Extended post-infection activity for BR; limited protective activity for BR
- Protective and post-infection activity for Bot
- Resistance risk for PM; Quantitative resistance has reduced efficacy of FRAC 3 materials for PM
- Moderate to high resistance risk for Bot
- Rainfast
- Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity)

cyprodinil + fludioxinil (Switch) -Bot

FRAC 9,12

- Very good efficacy
- Some resistance risk management provided through combination products
- Very expensive

fenamidone (Reason) -DM

FRAC 11

- Inexpensive
- Only need half the rate
- Resistance risk
- Label only for DM on grape

fenhexamid (Elevate) -PM, Bot

FRAC 17

- Very good efficacy for Bot
- Label only suppression for PM
- Protective and post-infection activity for Bot
- Zero day pre-harvest interval
- Moderate resistance risk
- Expensive

fluopicolid (Presidio) -DM

FRAC 43

- Highly effective
- Very expensive
- Label requires application with another unrelated DM material
- Label only for DM on grape
- New FRAC group

fosetyl-aluminum (Aliette) -DM

FRAC 33

- Excellent activity
- Excellent post-infection activity
- Exempt from tolerance from EPA; least toxic approach
- Short pre-harvest interval
- Potential resistance risk; may be starting
- Potential for phytotoxicity; not well understood
- More expensive than other phosphorous acid products
- Not in NYPA guide
- Label only for DM on grape

hydrogen dioxide (Oxidate) -PM

FRAC na

- Good eradicant activity
- No protective

- Need thorough coverage
- Expensive
- Can have tank mixing issues
- OMRI certified

iprodione (Rovral, Meteor) -Bot

FRAC 2

- Very good efficacy in the absence of resistance
- Protective and post-infection activity
- Resistance has developed but has been manageable

kresoxim-methyl (Sovran) –DM, PM, BR, Bot, PH

FRAC 11

- Less effective for DM than other strobilurins
- Highly effective for PM in the absence of resistance
- Highly effective for BR; primarily protective for BR; little post-infection activity for BR
- Label only suppression for Bot
- Poor efficacy for PH; not recommended for early season use; post-bloom fruit rot use only
- Resistance risk; PM resistance common
- Needs to be used with an effective tank mixing partner
- Rainfast
- Expensive

mancozeb (Manzate, Dithane) –DM, BR, PH

FRAC M3

- Effective
- Not PM material
- Very broad spectrum
- Economical
- Toxic to beneficial predacious mites
- Restricted by juice processors; no application after bloom
- Long pre-harvest interval
- Mainstay of conventional disease management programs
- A standard for Phomopsis management in the Northeast

mancozeb + zoxamide (Gavel) –DM, BR, PH

FRAC 22

- Moderately effective at labelled rate for DM, PH
- Not recommended for PH over full mancozeb
- Active ingredient zoxamide is DM specific
- Only active ingredient against BR is mancozeb; labelled rate insufficient; requires supplemental for reliable management
- Not PM material
- Expensive
- Low rate mancozeb at label rate
- New FRAC group

mandipropamid (Revus) -DM

FRAC 40

- Good efficacy
- Some post-infection activity
- Moderate resistance risk
- Label only for DM on grape

mandipropamid + difenoconazole (Revus Top) –DM, PM, BR, PH

FRAC 3+40

- Good efficacy for DM, PM, BR
- Poor efficacy for PH
- Not recommended for Phomopsis; mandipropamid has no activity against Phomopsis
- Some post-infection activity for DM, PM
- Limited protective activity for BR; extended post-infection activity for BR
- Only active ingredient against DM is mandipropamid
- Only active ingredient against BR is difenoconazole
- Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity)
- Economical
- Rainfast

mefenoxam + copper (Ridomil Gold Copper) –DM, PM

mefenoxam + mancozeb (Ridomil Gold MZ) –DM, BR, PH

FRAC 4

- Highly effective for DM; post-infection activity; vapor action
- Ridomil “Best DM fungicide ever invented”
- Suppresses PM due to copper
- Moderately effective for BR due to mancozeb
- Moderately effective for PH at labelled rate; not recommended over only mancozeb for PH
- Copper content as high as some copper products
- High resistance risk
- Low rate mancozeb at label rate; half rate mancozeb
- Expensive
- Not PM, BR material

metrafenone (Vivando) -PM

FRAC U8

- Most effective current material
- Post-infection activity vapor activity
- Resistance risk; use is limited
- New FRAC group

myclobutanil (Rally) –PM, BR

FRAC 3

- Moderately effective for PM
- Good efficacy for BR; extended post-infection activity for BR; limited protective activity for BR

- Also effective against Anthracnose
- Broad spectrum
- Resistance risk; quantitative resistance has reduced efficacy of FRAC 3 materials
- Quantitative resistance more prominent than with other FRAC 3 materials
- Rainfast

neem extract/derivatives (Trilogy) -PM

FRAC NC

- Good post-infection and eradicant activity
- Some suppression of mites
- No resistance concerns
- Only used against PM
- Potential incompatibility with numerous other pesticides
- Expensive
- Not in NYPA guide
- OMRI certified
- May have protectant activity

paraffinic oil (JMS Stylet Oil) -PM

FRAC NC

- Good post-infection and eradicant activity
- Some protectant activity
- Some suppression of mites
- No resistance concerns
- Only used against PM
- Potential incompatibility with numerous other pesticides
- Increases absorption of other materials
- OMRI certified

phosphorous acid (Phostrol, others) -DM

FRAC 33

- Excellent activity
- Excellent post-infection activity
- Exempt from tolerance from EPA –least toxic approach
- Short pre-harvest interval
- Potential resistance risk; may be starting
- Potential for phytotoxicity; not well understood
- Label only for DM on grape

polyoxin-D (Oso, Ph-D) –PM, Bot

FRAC 19

- Moderately effective
- Limited data and experience for Bot
- Unique FRAC group; rotation option

potassium bicarbonate (Milstop, Kaligreen, Armicarb) -PM

FRAC NC

- Good post-infection activity
- Some eradicant activity
- No resistance concerns
- No protective activity
- Only used against PM
- OMRI certified

monopotassium phosphate; dihydrogen potassium phosphate (Nutrol) -PM

FRAC na

- Good post-infection activity
- Some eradicant activity
- No resistance concerns
- No protective activity
- Label only for PM on grape
- Not in NESFMG

pyrimethanil (Scala) -Bot

FRAC 9

- Very good efficacy for Bot
- Protective and post-infection activity for Bot
- No significant activity against other diseases
- Not PM material
- Moderate to high resistance risk
- Expensive

quinoxifen (Quintec) -PM

FRAC 13

- Very good efficacy
- Good protective and vapor activity
- Unique FRAC group
- Protective activity only
- Moderate resistance risk
- Label only for PM on grape

***Reynoutria sachalinensis* extract (Regalia) -PM**

FRAC P5

- One of the more effective organic materials
- OMRI certified

sulfur (Microthiol, Kumulus, Thiolux) –PM, PH

FRAC M2

- Good efficacy for PM
- Poor efficacy for PH in under Northeast growing conditions; too wet; not recommended
- Inexpensive

- No resistance concerns
- Irritant
- Detrimental to beneficial predacious mites
- Phytotoxic to some native and hybrid varieties
- Residue possible at harvest can affect wine quality
- OMRI certified

lime sulfur

FRAC M2

- Effective
- Broad spectrum; general dormant clean-up
- Useful to organic
- Requires plant dormancy
- Corrosive material
- Efficient spray delivery is tricky on dormant vines
- Damaging to equipment
- Cleaning equipment is difficult
- Difficult to acquire in certain areas
- Dormant spray
- OMRI certified

tebuconazole + fluopyram (Luna Experience) –PM, BR, Bot, PH

FRAC 3+7

- Highly effective for PM
- Highly effective for BR at full rates
- Only active ingredient against BR is tebuconazole
- Very good efficacy for Bot
- Label only suppression for PH
- Some activity against other diseases
- Moderate resistance risk
- Some resistance risk management provided through combination of active ingredients
- Expensive
- Smaller packaging would be useful to small growers

tetraconazole (Mettle) –PM, BR

FRAC 3

- Fair to good efficacy for PM
- Good efficacy for BR; extended post-infection activity; limited protective activity
- Resistance risk; quantitative resistance has reduced efficacy of FRAC 3 materials
- Rainfast

thiophanate methyl (Topsin) –PM, BR, Bot, PH

FRAC 1

- Good efficacy for PM in the absence of resistance
- Efficacy unclear for BR; not used for BR
- Good efficacy for Bot in the absence of resistance

- Not recommended for PH
- High resistance risk
- Not in NYPA guide for PM, Bot (too much resistance)
- Used on multiple crops
- Old material

trifloxystrobin (Flint) –DM, PM, BR, Bot, PH

FRAC 11

- Poor efficacy for DM
- Highly effective for PM in the absence of resistance
- Highly effective for BR; primarily protective; little post-infection
- Poor efficacy for PH; not recommended for early season use; post-bloom fruit rot use only
- Good efficacy for Bot at labelled rate in the absence of resistance
- Resistance risk; resistance common for PM, Bot
- Rainfast
- Expensive
- Needs to be used with an effective tank mixing partner
- Phytotoxic to some native and hybrid varieties, Concord

triflumizole (Procure, Viticure) -PM

FRAC 3

- Moderately effective for PM
- Not BR material
- Resistance risk; quantitative resistance has reduced efficacy of FRAC 3 materials
- Quantitative resistance more prominent than with other FRAC 3 materials
- Narrower spectrum of activity than some other FRAC 3 materials

ziram (Ziram) –DM, BR, PH

FRAC M3

- Effective, economical for PH
- A standard for Phomopsis management in the Northeast
- Broad spectrum
- Protectant
- Short pre-harvest interval
- Long re-entry interval (48 hours)
- Not restricted by juice processors
- Similar to mancozeb
- Not as effective as mancozeb for DM
- Subject to removal by rain
- Higher toxicity; danger
- Toxic to beneficial predacious mites

Herbicides –Key Pest(s)

HRAC = Herbicide Resistance Action Committee (with mode of action classification code)

OMRI = Organic Materials Review Institute

Key Pest Name Abbreviations = see page 3

carfentrazone-ethyl (Aim) -Post

HRAC E

- Not commonly used
- Not in NJ Guide

clethodim (Select, Arrow, Intensity) -Post

HRAC A

- Not for bearing vineyards
- Not commonly used

dichlobenil (Casoron) –Pre, Post

HRAC L

- Provides long-term management of annual and perennial weeds
- Requires special equipment for application
- May have high potential for leaching
- Must be applied before weed emergence and when soil temperatures are cool (post-harvest to pre-bud break)
- Not commonly used as Post-emergent
- Not in NJ Guide as Post-emergent

diuron (Karmex, Direx) -Pre

HRAC C2

- Manages annual broadleaf weeds and some annual grasses
- Only for vineyards >3 years old
- High potential for resistance development in treated soils
- Not for use on sand, loamy sand, or gravelly soils

fluazifop-butyl (Fusilade) -Post

HRAC A

- Not commonly used

flumioxazin (Chateau) -Pre

HRAC E

- Pre-emergence management of most broadleaf and grass weeds
- No applications within 30 days of a previous one
- No application within 60 days of harvest
- Application after bud break requires shielded sprayer to minimize damage to vines
- Chateau SW is phasing out, WDG formulation is now being manufactured and promoted
- Not recommended to combine with glyphosate in tank mix

glufosinate (Rely) -Post

HRAC H

- Effective on most grasses and broadleaf weeds
- Can provide sucker management
- Avoid contact with desirable green tissue; can cause damage on young trunk tissue
- Burn down application during season
- Nonselective
- 280 formulation only (old formulation is phased out)

glyphosate (Roundup, Touchdown) -Post

HRAC G

- Very effective on most annual and perennial grasses and broadleaf weeds
- Contact with any green tissue including young trunks may cause long-term vine damage
- Dormant application recommended
- Non-selective

indaziflam (Alion) -Pre

HRAC L

- Not for nonbearing vineyards
- Not commonly used

isoxaben (Gallery) -Pre

HRAC L

- Not for bearing vineyards
- Not commonly used

napropamide (Devrinol) -Pre

HRAC K3

- Not commonly used

norflurazon (Solicam) -Pre

HRAC F1

- Not commonly used

oryzalin (Surflan) -Pre

HRAC K1

- Not commonly used

oxyfluorfen (Goal) –Pre, Post

HRAC E

- Not commonly used
- Not in NYPA guide
- Not in NJ Guide

paraquat (Gramoxone, Firestorm) -Post

HRAC D

- Highly effective on grasses and broadleaf weeds that receive full contact applications
- High mammalian toxicity
- No residual activity
- Effective sucker burndown
- Nonselective
- Increased attention to PPE and applicator safety necessary

pelargonic acid (Scythe) -Post

HRAC Z

- Not commonly used
- Not in NJ Guide

pendimethalin (Prowl, Pendimax, Satellite Hydrocap) -Pre

HRAC K1

- Not commonly used

pronamide (Kerb) –Pre, Post

HRAC K1

- Not for nonbearing vineyards
- Not commonly used
- Not in NESFMG
- Not in NJ Guide

pyraflufen ethyl (Venue) -Post

HRAC E

- Not commonly used
- Not in NYPA guide
- Not in NJ Guide

rimsulfuron (Matrix) -Pre

HRAC B

- Not for nonbearing vineyards
- Not commonly used

sethoxydim (Poast) -Post

HRAC A

- Not commonly used

simazine (Princep) -Pre

HRAC C1

- Not for nonbearing vineyards
- Not commonly used

terbacil (Sinbar) -Pre

HRAC C1

- Not for nonbearing vineyards
- Not commonly used

trifluralin (Treflan) -Pre

HRAC K1

- Not commonly used
- Not in NESFMG
- Not in NJ Guide

trifluran + isoxaben (Snapshot) -Pre

HRAC K1,L

- Not commonly used
- Not in NESFMG
- Not in NJ Guide

Research, Regulatory, and Education Priorities Summary

Research Needs

New chemistries and tools

- Develop new materials *specific to organic production*; include efficacy trials. (DM, BR, Bot, PH) Not a high priority for PH; cultural practices are more important for organic management. (PH)
- Trial new materials as they are developed; include efficacy trials. (DM, PM, Bot, PH) A continued need for PM. (PM)
- Independently trial new materials for BR as they are developed; include efficacy trials. Efficacy data against BR for new materials is limited even when the pest is listed on the label. (BR)
- There is a research need for materials to prevent infection (antimicrobials) and spread (insecticides). (Sour Rot Complex)

Specific materials and equipment

- Assess the effect of treatment prior to planting. (GP)
- Determine economic thresholds on native and hybrid varieties where the level of damage or crop reduction is mediated by use of spirotetramat (Movento). (GP)
- Explore practical techniques for cluster loosening to reduce infection risk. (Bot)
- Explore cane pruning on high cordon varieties and/or scheduled renewal of cordons/trunks to reduce inoculums. (PH)
- Characterize successful sanitation techniques. (PH)
- There is a research need to develop management practices: Is it better to remove infected vines or train a new trunk? Is a regular program to replace or re-trunk beneficial? (Crown Gall)
- There is a research need to develop management practices appropriate to disease severity. (Trunk dieback)

Scouting, lifecycles, habitat

- Explore the use of resistant rootstocks as a management method for cold-hardy and hybrid varieties. (GP)
- More information about table grape rootstocks, susceptibility, etc. is needed. (GP)
- Assess level of vine root damage that may occur when larvae (grub) populations are excessively high, especially in table grapes. Include other grub beetle species in assessment. (JB)
- Determine management thresholds for individual vines and/or vineyard-wide presence of adults and/or larvae (grubs). (JB)
- Explore impact of vineyard groundcover options on larvae (grub) populations. (JB)
- Determine spread and distribution of pest across region. (GBM)
- Explore winter effects on population. (GBM)
- Biology of this pest is well understood; research is needed to refine management. (DM)
- Increase understanding of relationship between crop physiology and disease development. (Bot)
- Determine what is too wet by bunch closure to improve application timing. (Bot)
- Explore ground cover alternatives to bare ground under vines. (Weeds)
- There is a research need to increase understanding of biology and management. (Anthracnose)
- There is a research need to increase understanding of causal organisms/complex and management. (Sour Rot Complex)

Surveys and actions

- Characterize the economic impact of management of the foliar pest on yield and quality where unmanaged is the default condition. (GP)
- Explore reduced-spray programs with less susceptible varieties and/or lower inoculum pressure. (DM)
- Improve risk assessment decision support systems to guide the need for fungicide application. (PM)
- Develop more NEWA models for grapes that are more predictive and sophisticated. (PM)
- Maintenance of weather stations is important to the use of NEWA models (temperature, humidity, cloudiness). (PM)
- Increase monitoring efforts to track resistance development. (PM)
- Continued need to refine timing of management. (PM)
- Explore integrating BR management into organic and/or reduced-spray programs; include specific sanitation recommendations, demo plots, cordon renewal. (BR)
- Improve risk assessment decision support systems to guide the need for fungicide application. (Bot)
- There is a research need to document prevalence and degree of economic loss. (Trunk dieback)

Regulatory Needs

Specific materials

- There is a regulatory need for fungicides to treat pruning wounds. (Trunk dieback)

Nursery and/or government actions

- Require nursery stock screening /treatment when shipping to areas without endemic populations. (GP)

Institutional actions

- Desperate need for weed specialists in New England following recent retirements; New England weed specialist are desired due to different growing conditions than other Northeast regions (NJ, NY, PA). (Weeds)

Education Needs

Scouting and identification

- Clarify what threshold levels look like to encourage proper management (i.e. pest presence is not the end of the world). (JB)
- Develop awareness that management thresholds are more sensitive during vineyard establishment. (JB)
- Develop awareness of disease biology and management, particularly within new growing regions. (PH)
- There is an educational need for identification factsheets. (Anthracnose)

Timing

- Promote treatment prior to planting new vineyards in areas with endemic populations. (GP)
- Provide specific recommendations for application timing for the many different products available. (GBM)
- Promote prioritized application of strongest materials during the window of fruit susceptibility (pre-bloom to bunch close) and later season application of weaker materials on leaves when fruit are resistant. (PM)
- Discourage calendar-based material application programs. (PM)
- Increase understanding of when infections occur, when treatment should occur, length of latency period (21 days). Increase understanding that when leaf lesions appear in mid-summer the fruit is no longer susceptible. (BR)
- Raise awareness of optimum timing for applications for efficiency and the importance of early application. (PH)
- Clarify differences in management timing for pre-emergent and post-emergent applications. (Weeds)

Methods

- Promote the need for resistant rootstock selection, particularly among new growers; information is available but new growers do not necessarily know they need to access it. (GP)
- Promote use of NEWA as a management tool (biofix, phenology), particularly among new growers. (GBM, PM)
- Raise awareness of proper use of pheromone traps and monitoring. (GBM)
- Promote management practices that reduce resistance development. (DM, PM, Bot)
- Promote importance of sanitation as a management tool, particularly among organic growers and homeowners. This is the only management option for BR in these groups. (BR, PM)
- Promote potential for zone-limited applications to target clusters. (Bot)
- Promote importance of removal of inoculum and suggest management practices (don't leave dropped fruit under vines, mechanical harvesters leave rachis as an inoculum source). (Bot)

Awareness

- Clarify definition of low/medium/high risk materials, particularly among new growers. (GBM)
- Raise awareness of new materials as they are developed; include efficacy results. (DM, PM, Bot, PH)
- New grower education programs (crop updates, biology, rational decision making) could make a big difference in disease management. Beginning growers have different educational needs than experienced growers. (PM)
- Develop awareness of target differences for herbicides (grasses, broadleaf, sedges, perennial weeds such as bindweed, particularly among new growers. (Weeds)
- There is an educational need for management decision awareness and planning. (Spotted Wing Drosophila)
- There is an educational need for identification and management awareness. (Grape Plume Moth, Leafhoppers)

III. Strategic Issues for Key Grape Pests

Key Insects and Mite pests

IRAC = Insecticide Resistance Action Committee (with mode of action classification code)

OMRI = Organic Materials Review Institute

Key Pest Name Abbreviations = see page iii

➤ Grape Phylloxera (*Phylloxera vitifoliae*)

- Heavily infested leaves may fall prematurely, retard shoot growth, and decrease vine vigor or vine death if roots are heavily infested.
- Manage before bloom when first galls are detected and again 10 to 12 days later if new growth becomes infested. Galls appearing before bloom will decrease crop quality. Once canopy has developed 1-2 weeks past bloom and fruit set, then damage is largely cosmetic.
- Huge differences in varietal susceptibility. Serious losses can occur in own-rooted susceptible varieties (vinifera). Loss by the root feeding form can be substantially reduced by grafting to a phylloxera-resistant rootstock. Varieties developed through breeding programs in areas with native *Phylloxera* (e.g. University of Minnesota) have tolerance to this pest.
- Endemic presence is assumed; most growers use resistant varieties and have high tolerance for this pest. Severity varies from year to year. Increasing population in some areas, possibly due to mild winters (Connecticut).

Currently Registered Pesticides (listed alphabetically)

Pesticide	Pros	Cons	Comments
acetamiprid (Assail) IRAC 4	<ul style="list-style-type: none"> • Less expensive than Movento (spirotetramat) • Useful in multiple crops against leafhoppers • Longer lasting systemic 	<ul style="list-style-type: none"> • Requires repeat applications 	<ul style="list-style-type: none"> • Movento (spirotetramat) is the preferred material • Also effective against leafhoppers and some activity against beetles
dinotefuran (Venom, Scorpion) IRAC 4		<ul style="list-style-type: none"> • Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves 	<ul style="list-style-type: none"> • Label only suppression • Neonicotinoid • Also effective against sucking insects • Not in NESFMG
fenpropathrin (Danitol) IRAC 3	<ul style="list-style-type: none"> • Not a neonicotinoid 	<ul style="list-style-type: none"> • Application timing critical; must target insect crawler stage • Harmful to natural enemies 	<ul style="list-style-type: none"> • Restricted use • Toxicity warning label

imidacloprid (Admire Pro, Provado, Leverage, Pasada) IRAC 4		<ul style="list-style-type: none"> •Timing different for soil application = reactive to previous year •Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves 	<ul style="list-style-type: none"> •Systemic •Can also be foliar application
potassium salts of fatty acids (Des-X, M-Pede) IRAC UN,0		<ul style="list-style-type: none"> •Hard to imagine they work 	<ul style="list-style-type: none"> •Not in NYPA guide •OMRI certified •Organic growers don't worry about GP
spirotetramat (Movento) IRAC 23	<ul style="list-style-type: none"> •Very effective •One application before bloom 	<ul style="list-style-type: none"> •More expensive than Assail 	<ul style="list-style-type: none"> •Systemic •May be economically feasible for Concord growers to use against the root form
thiamethoxam (Platinum, Actara) IRAC 4		<ul style="list-style-type: none"> •Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves 	<ul style="list-style-type: none"> •Neonicotinoid •Soil applied
thiamethoxam + chlorantraniliprole (Voliam Flexi) IRAC 28+4		<ul style="list-style-type: none"> •Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves 	<ul style="list-style-type: none"> •Neonicotinoid •Foliar application •Also effective against Lepidopterans, leafhoppers, and Japanese Beetles

Nonchemical (Cultural and Biological) Alternatives

Method	Pros	Cons	Comments
Plant varieties and rootstocks that are less susceptible to the root form	<ul style="list-style-type: none"> •Many varieties to choose from 		<ul style="list-style-type: none"> •Phylloxera is a secondary concern to fruit production
Plant in sandy soils	<ul style="list-style-type: none"> •Harbors less phylloxera 		
Remove wild grape vines	<ul style="list-style-type: none"> •Also useful for GBM management •Reduces pest habitat 	<ul style="list-style-type: none"> •Difficult to access vines •Hard to maintain management 	

Research Needs:

- Characterize the economic impact of management of the foliar pest on yield and quality where unmanaged is the default condition.
- Determine economic thresholds on native and hybrid varieties where the level of damage or crop reduction is mediated by use of spirotetramat (Movento).
- Explore the use of resistant rootstocks as a management method for cold-hardy and hybrid varieties.
- More information about table grape rootstocks, susceptibility, etc. is needed.
- Assess the effect of treatment prior to planting.

Regulatory Needs:

- Require nursery stock screening /treatment when shipping to areas without endemic populations.

Education Needs:

- Promote the need for resistant rootstock selection, particularly among new growers; information is available but new growers do not necessarily know they need to access it.
- Promote treatment prior to planting new vineyards in areas with endemic populations.

➤ **Japanese Beetle (*Popillia japonica*)**

- Damage is caused by direct feeding by adults on the leaves. Damage is mostly cosmetic in vigorously growing vines. Adult insects may contaminate clusters in earlier harvested varieties such as table grapes. Adults are highly mobile and may originate outside the vineyard.
- Management begins after adult beetles appear in early to mid-July.
- Many available materials are effective; one application is often sufficient if needed; cost and environmental considerations are the determining factors in material selection. Pheromone traps are not effective. Treating larvae in vineyard turf is not effective.
- Excessive foliar feeding in newly planted vineyards can result in delayed root and canopy development resulting in a delay of one year or more in terms of full crop production; may lead to removal of vineyard. Infestations have a larger impact on smaller acreage vineyards.
- Turf between vines and use of grow tubes on young vines may increase pest populations. Grow tubes are not recommended if this pest is present.
- Cultivars vary in susceptibility.

Currently Registered Pesticides (listed alphabetically)

Pesticide	Pros	Cons	Comments
acetamiprid (Assail) IRAC 4	<ul style="list-style-type: none"> • Useful in multiple crops against leafhoppers • Longer lasting systemic 		<ul style="list-style-type: none"> • Also effective against leafhoppers and Phylloxera
beta-cyfluthrin (Baythroid) IRAC 3			<ul style="list-style-type: none"> • Not discussed at meeting

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bifenthrin (Brigade) IRAC 3			• Not discussed at meeting
carbaryl (Sevin) IRAC 1	<ul style="list-style-type: none"> • Inexpensive • Immediately effective 	<ul style="list-style-type: none"> • Regular monitoring • May need additional applications • Can flare mite population 	<ul style="list-style-type: none"> • Most commonly used material • Not restricted use
chlorantraniliprole (Altacor) IRAC 28			• Not discussed at meeting
dinotefuran (Venom, Scorpion) IRAC 4		<ul style="list-style-type: none"> • Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves 	<ul style="list-style-type: none"> • Neonicotinoid • Also effective against sucking insects • Not in NESFMG
fenpropathrin (Danitol) IRAC 3	<ul style="list-style-type: none"> • Not a neonicotinoid 	<ul style="list-style-type: none"> • Harmful to natural enemies 	<ul style="list-style-type: none"> • Restricted use • Toxicity warning label
flubendiamide (Belt) IRAC 28			<ul style="list-style-type: none"> • Not discussed at meeting • Not in NYPA guide
imidacloprid (Admire Pro, Provado, Leverage, Pasada) IRAC 3,4		<ul style="list-style-type: none"> • Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves 	<ul style="list-style-type: none"> • Systemic
imidacloprid + bifenthrin (Brigadier) IRAC 4+3		<ul style="list-style-type: none"> • Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves 	<ul style="list-style-type: none"> • Not in NESFMG
indoxacarb (Avaunt) IRAC 22	<ul style="list-style-type: none"> • Longer lasting systemic 		
phosmet (Imidan) IRAC 1		<ul style="list-style-type: none"> • Long re-entry interval (14 days) 	

pyrethrins (Pyganic) IRAC 3			<ul style="list-style-type: none"> • Not discussed at meeting • OMRI certified • Not in NESFMG
pyrethrins + piperonyl butoxide (Evergreen) IRAC 27+3			<ul style="list-style-type: none"> • Not in NESFMG • OMRI certified
thiamethoxam (Platinum, Actara) IRAC 4		<ul style="list-style-type: none"> • Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves 	<ul style="list-style-type: none"> • Neonicotinoid
thiamethoxam + chlorantraniliprole (Voliam Flexi) IRAC 28+4		<ul style="list-style-type: none"> • Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves 	<ul style="list-style-type: none"> • Neonicotinoid • Also effective against Lepidopterans and leafhoppers
zeta-cypermethrin (Mustang Max) IRAC 3			<ul style="list-style-type: none"> • Not discussed at meeting

Nonchemical (Cultural and Biological) Alternatives

Method	Pros	Cons	Comments
Plant less susceptible varieties (juice grapes, hybrids)	<ul style="list-style-type: none"> • Thicker leaves are less attractive to beetles 		

Research Needs:

- Assess level of vine root damage that may occur when larvae (grub) populations are excessively high, especially in table grapes. Include other grub beetle species in assessment.
- Determine management thresholds for individual vines and/or vineyard-wide presence of adults and/or larvae (grubs).
- Explore impact of vineyard groundcover options on larvae (grub) populations.

Regulatory Needs:

- None

Education Needs:

- Clarify what threshold levels look like to encourage proper management (i.e. pest presence is not the end of the world).
- Develop awareness that management thresholds are more sensitive during vineyard establishment.

➤ **Grape Berry Moth** (*Paralibesia viteana*)

- Direct feeding on clusters by larvae during the bloom period. After berries have developed, larvae enter berries and feed within. Late season feeding results in damage to multiple berries per cluster.
- Management is determined by using established risk assessment models that utilize biofix and phenology and by scouting for adults. Timings could include; immediate post bloom, first week in August and first week in September. Models improve application timing against second generation.
- Timing varies with different materials. Mating disruption products are effective but rarely used. Resistance developed to Sevin in the Lake Erie region has prompted a switch to other products (Danitol, Provado, imidacloprid, etc.).
- Cluster infestation at harvest is not uncommon and complete crop loss can occur. Tight cluster, rot susceptible varieties are likely to have higher infestations. Crop loss is higher near the edge of vineyards and dependent on surrounding habitat. Secondary fungal infection can seriously affect wine quality.
- Federal inspection standards make this a key insect of juice grapes.
- Insect presence is increasing in the upper New England states.

Currently Registered Pesticides (listed alphabetically)

Pesticide	Pros	Cons	Comments
<i>Bacillus thuringiensis</i> (Biobit, Dipel, Deliver) IRAC 11	• Can be used successfully	• Proper timing is critical • Repeat application required	• OMRI certified
beta-cyfluthrin (Baythroid) IRAC 3			• Not discussed at meeting
bifenthrin (Brigade) IRAC 3			• Not discussed at meeting
carbaryl (Sevin) IRAC 1	• Inexpensive • Immediately effective	• Regular monitoring • May need additional applications • Can flare mite population • Resistance developed in Lake Erie region	• Most commonly used material • Not restricted use
chlorantraniliprole (Altacor) IRAC 28			• Not discussed at meeting

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dinotefuran (Venom, Scorpion) IRAC 4		<ul style="list-style-type: none"> •Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves 	<ul style="list-style-type: none"> •Neonicotinoid •Also effective against sucking insects
fenpropathrin (Danitol) IRAC 3	<ul style="list-style-type: none"> •Not a neonicotinoid 	<ul style="list-style-type: none"> •Harmful to natural enemies 	<ul style="list-style-type: none"> •Restricted use •Toxicity warning label
flubendiamide (Belt) IRAC 28			<ul style="list-style-type: none"> •Not discussed at meeting
flubendiamide + buprofezin (Tourismo) IRAC 28+16			<ul style="list-style-type: none"> •Not discussed at meeting
imidacloprid (Admire Pro, Provado, Leverage, Pasada) IRAC 4		<ul style="list-style-type: none"> •Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves 	<ul style="list-style-type: none"> •Systemic
imidacloprid + bifenthrin (Brigadier) IRAC 4+3		<ul style="list-style-type: none"> •Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves 	<ul style="list-style-type: none"> •Not in NESFMG
indoxacarb (Avaunt) IRAC 22	<ul style="list-style-type: none"> •Longer lasting systemic 		
methoxyfenozide (Intrepid) IRAC 18	<ul style="list-style-type: none"> •Effective; good success •One application timed with NEWA model 		<ul style="list-style-type: none"> •Insect growth regulator
phosmet (Imidan) IRAC 1		<ul style="list-style-type: none"> •Long re-entry interval (14 days) 	
potassium salts of fatty acids (Des-X, M-Pede) IRAC UN,0			<ul style="list-style-type: none"> •Not in NYPA guide •OMRI certified

pyrethrins (Pyganic) IRAC 3			<ul style="list-style-type: none"> • Not discussed at meeting • OMRI certified • Not in NESFMG
pyrethrins + piperonyl butoxide (Evergreen) IRAC 27+3			<ul style="list-style-type: none"> • Not in NESFMG • OMRI certified
spinetoram (Delegate) IRAC 5	<ul style="list-style-type: none"> • Less expensive than Entrust 		<ul style="list-style-type: none"> • Related to Entrust • Not organic
spinosad (Entrust) IRAC 5	<ul style="list-style-type: none"> • Effective 	<ul style="list-style-type: none"> • More expensive than Delegate • SWD reserve, especially organic growers 	<ul style="list-style-type: none"> • Not in NESFMG • OMRI certified
thiamethoxam + chlorantraniliprole (Voliam Flexi) IRAC 28+4		<ul style="list-style-type: none"> • Bee toxicity concern if foliar application when row cover or nearby vegetation in bloom; bees are not in grapes themselves 	<ul style="list-style-type: none"> • Neonicotinoid • Also effective against leafhoppers and Japanese Beetles
zeta-cypermethrin (Mustang Max) IRAC 3			<ul style="list-style-type: none"> • Not discussed at meeting

Nonchemical (Cultural and Biological) Alternatives

Method	Pros	Cons	Comments
Only spot apply materials along vineyard edges that border wooded areas	<ul style="list-style-type: none"> • Curbs spread into vineyard • Saves application material and time 	<ul style="list-style-type: none"> • Tricky if rows are perpendicular to bordering woods 	
Remove wooded areas around vineyard	<ul style="list-style-type: none"> • Reduces pest habitat 	<ul style="list-style-type: none"> • May be difficult to access 	
Remove wild grape vines	<ul style="list-style-type: none"> • Also useful for Phylloxera management • Reduces pest habitat 	<ul style="list-style-type: none"> • Difficult to access vines • Hard to maintain management 	

Research Needs:

- Determine spread and distribution of pest across region.
- Explore winter effects on population.

Regulatory Needs:

- None

Education Needs:

- Promote use of NEWA as a management tool (biofix, phenology), particularly among new growers.
- Provide specific recommendations for application timing for the many different products available.
- Raise awareness of proper use of pheromone traps and monitoring.
- Clarify definition of low/medium/high risk materials, particularly among new growers.

Selected Comments on Other Insects

These insects are not considered Key Pests but do warrant special note as existing or emerging issues in Northeast. Listed alphabetically by common name.

Spotted Wing Drosophila (*Drosophila suzukii*)

- Ovipositor damage provides opening for rot, yellow jackets, other fruit flies.
- Impact of direct damage is still being assessed. Awareness of potential threat is high.
- Management decisions for other pests may limit materials available for SWD management due to application limits.
- There is an educational need for management decision knowledge and planning.

Grape Root Borer (*Vitacea polistiformis*)

- Chlorpyrifos (Lorsban) is the only management material, and would become unavailable under an organophosphate ban.
- Pest is moving north (NJ) and spreading to other regions.

Grape Rootworm (*Fidia viticida*)

- Historical pest coming back due to growers spraying less, especially in Lake Erie region.

Grape Flea Beetle (*Altica chalybea*)

Banded Grape Bug (*Taedia scrupeus*)

Lygus Bug (*Lygocoris inconspicuus*)

- Early season pests of note.

Grape Plume Moth (*Geina periscelidactylus*)

- Cosmetic; highly visible in spring.
- There is an educational need for identification and management awareness.

Grape Mealybug (*Pseudococcus maritimus*)

- Vector for Grape Leafroll Virus.
- Many biocontrol options available against low populations; spirotetramat (Movento) has been shown to reduce populations and slow the spread of the virus.

Two spotted Spider Mite (*Tetranychus urticae*)

European Red Mite (*Panonychus ulmi*)

- Not a problem unless using materials that induce mite population flares.

Eastern Grape Leafhopper (*Erythroneura comes*)

Potato Leafhopper (*Empoasca fabae*)

- EGL are pests of juice grapes (Concord, labrusca varieties); PLH are pests of vinifera and hybrid varieties.

- EGL overwinter as adults; two generations per year. Feeding damage leads to photosynthesis loss. PLH overwinter in southern regions and blow north during seasonal weather patterns; severity varies by variety; unpredictable.
- More problematic in dry years, especially with heavy crop.
- Grape Berry Moth management programs will typically also manage leafhoppers.
- There is an educational need for damage identification and management awareness.

Brown Marmorated Stinkbug (*Halyomorpha halys*)

- Hasn't established in VT; not a problem in NJ, Lake Erie/Ontario, Finger Lakes.

Multicolored Asian Ladybeetle (*Harmonia axyridis*)

- Late season; horrid flavor effects on wine (3-4 adults per lug).
- Five years ago was a problem year; not much since.

Grape Cane Girdler (*Ampelogypter ater*)

- Occasionally in spring.

Tumid Gallmaker (*Janetiella brevicauda*)

- Cosmetic; highly visible in spring.
- Homeowner concern.

Key Diseases

FRAC = Fungicide Resistance Action Committee (with mode of action classification code)

OMRI = Organic Materials Review Institute

Key Pest Name Abbreviations = see page iii

➤ **Downy Mildew** (*Plasmopara viticola*)

- Berries, leaves and young shoots can be infected. This can result in a loss of growth with early season shoot infection, premature defoliation with leaf infections and direct crop loss through berry infections. End of season defoliation impacts overwintering.
- Management occurs at 10-inch shoot growth through harvest, depending on frequency of early season rainfall, varietal susceptibility and overwintering inoculum.
- Endemic presence is assumed and managed for; huge issue on susceptible varieties, still an issue on less-susceptible varieties; 'La Crescent' most susceptible of cold-hardy varieties.
- Yield loss can be up to 100% if early season infections to shoots, leaves and /or clusters are not managed.

Currently Registered Pesticides (listed alphabetically)

Pesticide	Pros	Cons	Comments
ametoctradin + dimethomorph (Zampro) FRAC 45+40	• Highly effective	• Expensive	• New material • Label only for DM on grape
azoxystrobin (Abound, Azaka, Quadris) FRAC 11	• Highly effective	• High resistance risk; no longer used in intense growing regions	• Resistance develops rapidly; undetected until after develops • Should combine with another material to reduce resistance risk
azoxystrobin + difenoconazole (Quadris Top) FRAC 11+3	• Combination product	• Resistance risk • Only active ingredient against DM is azoxystrobin • Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity)	• Also effective against PM, BR, and Anthracnose (difenoconazole activity)
<i>Bacillus pumilis</i> (Sonata) FRAC 44		• Poor efficacy	• OMRI certified • More likely effective under low pressure or with resistant varieties
flutriafol (Rhyme, Topguard) FRAC 3			• Not discussed at meeting

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boscalid + pyraclostrobin (Pristine) FRAC 11+7		<ul style="list-style-type: none"> • Resistance risk • Long, confusing re-entry interval • Only active ingredient against DM is pyraclostrobin • Phytotoxic to some hybrid and native varieties 	<ul style="list-style-type: none"> • Also effective against BR (pyraclostrobin activity) • Also effective against PM and Bot (boscalid activity)
captan (Captan, Captec) FRAC M4	<ul style="list-style-type: none"> • Broad spectrum • No resistance concerns • Inexpensive 	<ul style="list-style-type: none"> • Long re-entry interval • Restrictions by juice grape processors, sale to Canada • Severe phytotoxicity possible when mixed with oils (increased absorption) • Application temperature restrictions 	<ul style="list-style-type: none"> • Under scrutiny by EPA
copper, fixed (Champ, C-O-C-S, Kocide) FRAC M1	<ul style="list-style-type: none"> • Effective • Broad spectrum • No resistance concerns 	<ul style="list-style-type: none"> • Phytotoxic to some varieties (increased absorption) • Phytotoxicity increases with cool, slow drying conditions (increased absorption) • Accumulation in soil may eventually become toxic (Europe) 	<ul style="list-style-type: none"> • OMRI certified (certain formulations) • Lifetime limit on applications in dairy industry
copper sulfate + lime (Bordeaux mix) FRAC na		<ul style="list-style-type: none"> • Difficult to blend 	<ul style="list-style-type: none"> • Not in NYPA guide • Fixed coppers are easier to use • OMRI certified
cyazofamid (Ranman) FRAC 21	<ul style="list-style-type: none"> • Good efficacy • Multiple crop use • Rotation option 	<ul style="list-style-type: none"> • Protective only 	<ul style="list-style-type: none"> • New FRAC group; only material in category • Not much product information • Label only for DM on grape
fenamidone (Reason) FRAC 11	<ul style="list-style-type: none"> • Inexpensive • Only need half the rate 	<ul style="list-style-type: none"> • Resistance risk 	<ul style="list-style-type: none"> • Label only for DM on grape

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fluopicolid (Presidio) FRAC 43	<ul style="list-style-type: none"> • Highly effective 	<ul style="list-style-type: none"> • Very expensive • Label requires application with another unrelated DM material 	<ul style="list-style-type: none"> • Label only for DM on grape • New FRAC group
fosetyl-aluminum (Aliette) FRAC 33	<ul style="list-style-type: none"> • Excellent activity • Excellent post-infection activity • Exempt from tolerance from EPA; least toxic approach • Short pre-harvest interval 	<ul style="list-style-type: none"> • Potential resistance risk; may be starting • Potential for phytotoxicity; not well understood • More expensive than other phosphorous acid products 	<ul style="list-style-type: none"> • Not in NYPA guide • Label only for DM on grape
kresoxim-methyl (Sovran) FRAC 11		<ul style="list-style-type: none"> • Resistance risk • Less effective than other strobilurins 	
mancozeb (Manzate, Dithane) FRAC M3	<ul style="list-style-type: none"> • Very broad spectrum • Effective • Economical 	<ul style="list-style-type: none"> • Toxic to beneficial predacious mites • Restricted by juice processors; no application after bloom • Long pre-harvest interval 	<ul style="list-style-type: none"> • Mainstay of conventional disease management programs
mancozeb + zoxamide (Gavel) FRAC 22		<ul style="list-style-type: none"> • Moderately effective at labelled rate • Expensive 	<ul style="list-style-type: none"> • Active ingredient zoxamide is DM specific • Low rate mancozeb • New FRAC group
mandipropamid (Revus) FRAC 40	<ul style="list-style-type: none"> • Good efficacy • Some post-infection activity 	<ul style="list-style-type: none"> • Moderate resistance risk 	<ul style="list-style-type: none"> • Label only for DM on grape
mandipropamid + difenoconazole (Revus Top) FRAC 3+40	<ul style="list-style-type: none"> • Good efficacy • Some post-infection activity • Economical 	<ul style="list-style-type: none"> • Only active ingredient against DM is mandiproramid • Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity) 	<ul style="list-style-type: none"> • Also effective against PM, BR, and Anthracnose (difenoconazole activity)
mefenoxam + copper (Ridomil Gold Copper) mefenoxam + mancozeb (Ridomil Gold MZ) FRAC 4	<ul style="list-style-type: none"> • Highly effective • Post-infection activity • Vapor action • Copper content as high as some copper products 	<ul style="list-style-type: none"> • High resistance risk • Half rate mancozeb 	<ul style="list-style-type: none"> • Ridomil “Best DM fungicide ever invented”

phosphorous acid (Phostrol, others) FRAC 33	<ul style="list-style-type: none"> •Excellent activity •Excellent post-infection activity •Exempt from tolerance from EPA –least toxic approach •Short pre-harvest interval 	<ul style="list-style-type: none"> •Potential resistance risk; may be starting •Potential for phytotoxicity; not well understood 	<ul style="list-style-type: none"> •Label only for DM on grape
trifloxystrobin (Flint) FRAC 11	<ul style="list-style-type: none"> •Poor efficacy 	<ul style="list-style-type: none"> •Resistance risk 	
ziram (Ziram) FRAC M3	<ul style="list-style-type: none"> •Broad spectrum •Protectant •Short pre-harvest interval •Not restricted by juice processors 	<ul style="list-style-type: none"> •Not as effective as mancozeb 	<ul style="list-style-type: none"> •Similar to mancozeb

Nonchemical (Cultural and Biological) Alternatives

Method	Pros	Cons	Comments
Plant less susceptible varieties (hybrids)	<ul style="list-style-type: none"> •Reduces material applications (half as many as vinifera) 	<ul style="list-style-type: none"> •Will not prevent 	<ul style="list-style-type: none"> •Some exceptions: hybrids Vidal and Chancellor are very susceptible
Canopy management and shoot thinning	<ul style="list-style-type: none"> •Improves spray penetration and air flow 	<ul style="list-style-type: none"> •Will not prevent 	
Tenting	<ul style="list-style-type: none"> •Keeping rain off vines curbs spread 	<ul style="list-style-type: none"> •Very expensive 	<ul style="list-style-type: none"> •Seen in Italy

Research Needs:

- Biology of this pest is well understood; research is needed to refine management.
- Develop new materials *specific to organic production*; include efficacy trials.
- Trial new materials as they are developed; include efficacy trials.
- Explore reduced-spray programs with less susceptible varieties and/or lower inoculum pressure.

Regulatory Needs:

- None

Education Needs:

- Raise awareness of new materials as they are developed; include efficacy results.
- Promote management practices that reduce resistance development.

➤ **Powdery Mildew** (*Erysiphe necator*)

- The fungus can infect all green tissues of the grapevine. Expanding leaves that are infected become distorted and stunted. Cluster infection at bloom may result in poor set and considerable crop loss. Infection when berries are pea-size or larger may result in split berries. Infection when berries begin to ripen may cause purple or red cultivars to fail to color properly and have a blotchy appearance at harvest. Such fruit will produce wines with off flavors.
- Management occurs at 1-inch shoot growth for highly susceptible varieties or problem areas if rain and temperatures above 50°F are predicted, and continue through late summer.
- Huge differences in varietal susceptibility.
- Yield loss can be up to 100% with severe, early season infections important as the fruit becomes unmarketable for wine due to the off flavors from the infected berries.

Currently Registered Pesticides (listed alphabetically)

Pesticide	Pros	Cons	Comments
azoxystrobin (Abound, Azaka, Quadris) FRAC 11	<ul style="list-style-type: none"> • Highly effective in the absence of resistance 	<ul style="list-style-type: none"> • High resistance risk; still used in combination products with effective materials 	<ul style="list-style-type: none"> • Resistance develops rapidly; undetected until after develops • Should combine with another material to reduce resistance risk • Also effective against DM
azoxystrobin + difenoconazole (Quadris Top) FRAC 11+3	<ul style="list-style-type: none"> • Combination product • Very effective 	<ul style="list-style-type: none"> • Resistance risk • Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity) 	<ul style="list-style-type: none"> • Also effective against DM (azoxystrobin activity) • Also effective against BR and Anthracnose (difenoconazole activity)
<i>Bacillus amyloliquefaciens</i> (Double Nickel) FRAC 44		<ul style="list-style-type: none"> • Limited efficacy 	<ul style="list-style-type: none"> • OMRI certified
<i>Bacillus pumilis</i> (Sonata) FRAC 44		<ul style="list-style-type: none"> • Limited efficacy 	<ul style="list-style-type: none"> • OMRI certified • More likely effective under low pressure or with resistant varieties
benzovindiflupyr (Aprovia) FRAC 7			<ul style="list-style-type: none"> • Not discussed at meeting
boscalid (Endura) FRAC 7	<ul style="list-style-type: none"> • Effective 	<ul style="list-style-type: none"> • Moderate resistance risk • Pristine preferred at similar price with broader spectrum 	<ul style="list-style-type: none"> • Also effective against Bot

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<p>boscalid + pyraclostrobin (Pristine) FRAC 11+7</p>	<ul style="list-style-type: none"> •Effective; especially where pyraclostrobin alone is no longer effective •Wide spectrum activity 	<ul style="list-style-type: none"> •Resistance management provided by combination pertains only to PM •Long, confusing re-entry interval •Only active ingredient against PM is boscalid •Phytotoxic to some hybrid and native varieties 	<ul style="list-style-type: none"> •Also effective against Bot (boscalid activity) •Also effective against DM and BR (pyraclostrobin activity)
<p>copper, fixed (Champ, C-O-C-S, Kocide) FRAC M1</p>	<ul style="list-style-type: none"> •Broad spectrum •No resistance concerns 	<ul style="list-style-type: none"> •Modestly effective on Concord and native varieties •Poor efficacy on vinifera varieties •Phytotoxic to some varieties (increased absorption) •Phytotoxicity increases with cool, slow drying conditions (increased absorption) •Accumulation in soil may eventually become toxic (Europe) 	<ul style="list-style-type: none"> •OMRI certified (certain formulations) •Lifetime limit on applications in dairy industry
<p>copper sulfate + lime (Bordeaux mix) FRAC na</p>		<ul style="list-style-type: none"> •Difficult to blend 	<ul style="list-style-type: none"> •Not in NYPA guide •Fixed coppers are easier to use •OMRI certified
<p>cyflufenamid (Torino) FRAC U6</p>	<ul style="list-style-type: none"> •Good efficacy •Good for rotation 	<ul style="list-style-type: none"> •Not as effective as other materials 	<ul style="list-style-type: none"> •New FRAC group; only material in category
<p>cyprodinil (Vanguard) FRAC 9</p>			<ul style="list-style-type: none"> •Label only suppression
<p>cyprodinil + difenoconazole (Inspire Super) FRAC 3+9</p>	<ul style="list-style-type: none"> •Good efficacy •Most active among FRAC 3 materials 	<ul style="list-style-type: none"> •Resistance risk; Quantitative resistance has reduced efficacy of FRAC 3 materials •Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity) 	<ul style="list-style-type: none"> •Also effective against BR and Anthracnose (difenoconazole activity)

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fenhexamid (Elevate) FRAC 17			•Label only suppression
flutriafol (Rhyme, Topguard) FRAC 3			•Not discussed at meeting
hydrogen dioxide (Oxidate) FRAC na	•Good eradicant activity	•No protective •Need thorough coverage •Expensive •Can have tank mixing issues	•OMRI certified
kresoxim-methyl (Sovran) FRAC 11	•Highly effective in the absence of resistance	•Resistance common •Needs to be used with an effective tank mixing partner	
mancozeb (Manzate, Dithane) FRAC M3	•Very broad spectrum •Effective •Economical	•Toxic to beneficial predacious mites •Restricted by juice processors; no application after bloom •Long pre-harvest interval	•Mainstay of conventional disease management programs •Not PM material
mancozeb + zoxamide (Gavel) FRAC 22		•Moderately effective at labelled rate •Expensive	•Also effective against DM (zoxamide activity) •Low rate mancozeb •New FRAC group •Not PM material
mandipropamid + difenoconazole (Revus Top) FRAC 3+40	•Good efficacy •Some post-infection activity •Economical	•Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity)	•Also effective against DM (mandipropamid activity) •Also effective against BR and Anthracnose (difenoconazole activity)
mefenoxam + copper (Ridomil Gold Copper) FRAC 4	•Copper as high as some copper products	•High resistance risk •Half rate mancozeb	•Suppresses PM due to copper
metrafenone (Vivando) FRAC U8	•Most effective current material •Post-infection activity vapor activity	•Resistance risk; use is limited	•New FRAC group

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myclobutanil (Rally) FRAC 3	<ul style="list-style-type: none"> •Moderately effective •Broad spectrum 	<ul style="list-style-type: none"> •Resistance risk; Quantitative resistance has reduced efficacy of FRAC 3 materials •Quantitative resistance more prominent than with other FRAC 3 materials 	<ul style="list-style-type: none"> •Also effective against BR and Anthracnose
neem extract/derivatives (Trilogy) FRAC NC	<ul style="list-style-type: none"> •Good post-infection and eradicant activity •Some suppression of mites •No resistance concerns 	<ul style="list-style-type: none"> •Only used against PM •Potential incompatibility with numerous other pesticides •Expensive 	<ul style="list-style-type: none"> •Not in NYPA guide •OMRI certified •May have protectant activity
paraffinic oil (JMS Stylet Oil) FRAC NC	<ul style="list-style-type: none"> •Good post-infection and eradicant activity •Some protectant activity •Some suppression of mites •No resistance concerns 	<ul style="list-style-type: none"> •Only used against PM •Potential incompatibility with numerous other pesticides •Increases absorption of other materials 	<ul style="list-style-type: none"> •OMRI certified
polyoxin-D (Oso, Ph-D) FRAC 19	<ul style="list-style-type: none"> •Moderately effective •Unique FRAC group; rotation option 		
potassium bicarbonate (Milstop, Kaligreen, Armicarb) FRAC NC	<ul style="list-style-type: none"> •Good post-infection activity •Some eradicant activity •No resistance concerns 	<ul style="list-style-type: none"> •No protective activity •Only used against PM 	<ul style="list-style-type: none"> •OMRI certified
monopotassium phosphate; dihydrogen potassium phosphate (Nutrol) FRAC na	<ul style="list-style-type: none"> •Good post-infection activity •Some eradicant activity •No resistance concerns 	<ul style="list-style-type: none"> •No protective activity 	<ul style="list-style-type: none"> •Label only for PM on grape •Not in NESFMG
pyrimethanil (Scala) FRAC 9			<ul style="list-style-type: none"> •Not PM material
quinoxifen (Quintec) FRAC 13	<ul style="list-style-type: none"> •Very good efficacy •Good protective and vapor activity •Unique FRAC group 	<ul style="list-style-type: none"> •Protective activity only •Moderate resistance risk 	<ul style="list-style-type: none"> •Label only for PM on grape
<i>Reynoutria sachalinensis</i> extract (Regalia) FRAC P5	<ul style="list-style-type: none"> •One of the more effective organic materials 		<ul style="list-style-type: none"> •OMRI certified

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sulfur (Microthiol, Kumulus, Thiolux) FRAC M2	<ul style="list-style-type: none"> • Good efficacy • Inexpensive • No resistance concerns 	<ul style="list-style-type: none"> • Irritant • Detrimental to beneficial predacious mites • Phytotoxic to some native and hybrid varieties • Residue possible at harvest can affect wine quality 	<ul style="list-style-type: none"> • OMRI certified
tebuconazole + fluopyram (Luna Experience) FRAC 3+7	<ul style="list-style-type: none"> • Highly effective • Some resistance risk management provided through combination of active ingredients 	<ul style="list-style-type: none"> • Expensive • Smaller packaging would be useful to small growers 	<ul style="list-style-type: none"> • Also effective against BR depending on rate (tebuconazole activity) • Also effective against Bot at high label rate (fluopyram activity)
tetraconazole (Mettle) FRAC 3	<ul style="list-style-type: none"> • Fair to good efficacy 	<ul style="list-style-type: none"> • Resistance risk; Quantitative resistance has reduced efficacy of FRAC 3 materials 	<ul style="list-style-type: none"> • Also effective against BR
thiophanate methyl (Topsin) FRAC 1	<ul style="list-style-type: none"> • Good efficacy in the absence of resistance 	<ul style="list-style-type: none"> • High resistance risk 	<ul style="list-style-type: none"> • Not in NYPA guide (too much resistance) • Used on multiple crops • Old material
trifloxystrobin (Flint) FRAC 11	<ul style="list-style-type: none"> • Highly effective in the absence of resistance 	<ul style="list-style-type: none"> • Resistance common • Needs to be used with an effective tank mixing partner • Phytotoxic to some native and hybrid varieties 	
triflumizole (Procure, Viticure) FRAC 3	<ul style="list-style-type: none"> • Moderately effective 	<ul style="list-style-type: none"> • Resistance risk; Quantitative resistance has reduced efficacy of FRAC 3 materials • Quantitative resistance more prominent than with other FRAC 3 materials • Narrower spectrum of activity than some other FRAC 3 materials 	

Nonchemical (Cultural and Biological) Alternatives

Method	Pros	Cons	Comments
Site selection	• Improves air flow and sunlight exposure		• North-South row orientation maximizes sunlight exposure
Plant less susceptible varieties (hybrids)	• Reduces material applications (half as many as vinifera)	• Will not prevent	
Canopy management, shoot thinning, and leaf removal	• Improves spray penetration, air flow, and sunlight exposure	• Will not prevent	

Research Needs:

- Improve risk assessment decision support systems to guide the need for fungicide application.
- Develop more NEWA models for grapes that are more predictive and sophisticated.
- Maintenance of weather stations is important to the use of NEWA models (temperature, humidity, cloudiness).
- Increase monitoring efforts to track resistance development.
- Continued need for trials of new materials as they are developed; include efficacy trials.
- Continued need to refine timing of management.

Regulatory Needs:

- None

Education Needs:

- Promote prioritized application of strongest materials during the window of fruit susceptibility (pre-bloom to bunch close) and later season application of weaker materials on leaves when fruit are resistant.
- Discourage calendar-based material application programs.
- New grower education programs (crop updates, biology, rational decision making) could make a big difference in disease management. Beginning growers have different educational needs than experienced growers.
- Promote NEWA as a good education resource with lots of available information.
- Raise awareness of new materials as they are developed; include efficacy results.
- Promote management practices that reduce resistance development.

➤ **Black Rot** (*Guignardia bidwellii*)

- This disease is one of the most serious diseases of grapes in the eastern United States and can cause substantial crop loss under the appropriate environmental conditions. All green tissues of the vine are susceptible to infection.
- Disease severity the previous year and varietal susceptibility to black rot and weather are the major factors in determining how early protection is required. Critical management window is immediate pre-bloom through 3-4 weeks (Concord) or 4-5 week (vinifera) post-bloom. Under heavy disease pressure protectant application may begin as early as 6-10 inch shoot growth on susceptible varieties.
- Most difficult pest to manage organically; common problem for homeowners due to lack of available materials; some differences in varietal susceptibility.
- Yield loss can be up to 100% in years of frequent early rainfall that favors development of primary infections.

Currently Registered Pesticides (listed alphabetically)

Pesticide	Pros	Cons	Comments
azoxystrobin (Abound, Azaka, Quadris) FRAC 11	<ul style="list-style-type: none"> • Highly effective • Rainfast 	<ul style="list-style-type: none"> • Primarily protective; little post-infection activity • Potential drift issues; highly phytotoxic to some apples 	<ul style="list-style-type: none"> • Also effective against DM
azoxystrobin + difenoconazole (Quadris Top) FRAC 11+3	<ul style="list-style-type: none"> • Combination product • Protective and post-infection activity • Both ingredients highly effective 	<ul style="list-style-type: none"> • Potential drift issues; highly phytotoxic to some apples • Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity) 	<ul style="list-style-type: none"> • Also effective against DM (azoxystrobin activity) • Also effective against PM and Anthracnose (difenoconazole activity)
benzovindiflupyr (Aprovia) FRAC 7			<ul style="list-style-type: none"> • Not discussed at meeting
boscalid + pyraclostrobin (Pristine) FRAC 11+7	<ul style="list-style-type: none"> • Highly effective • Rainfast 	<ul style="list-style-type: none"> • Long re-entry interval for some tasks • Only active ingredient against BR is pyraclostrobin • Phytotoxic to some hybrid and native varieties 	<ul style="list-style-type: none"> • Also effective against DM (pyraclostrobin activity) • Also effective against PM and Bot (boscalid activity)

captan (Captan, Captec) FRAC M4	<ul style="list-style-type: none"> •Broad spectrum •No resistance concerns •Inexpensive 	<ul style="list-style-type: none"> •Only moderately effective •Long re-entry interval •Restrictions by juice grape processors, sale to Canada •Severe phytotoxicity possible when mixed with oils (increased absorption) •Application temperature restrictions 	<ul style="list-style-type: none"> •Under scrutiny by EPA
copper, fixed (Champ, C-O-C-S, Kocide) FRAC M1	<ul style="list-style-type: none"> •Most effective current OMRI certified materials •Broad spectrum •No resistance concerns 	<ul style="list-style-type: none"> •Only moderately effective with short spray intervals •Phytotoxic to some varieties (increased absorption) •Phytotoxicity increases with cool, slow drying conditions (increased absorption) •Accumulation in soil may eventually become toxic (Europe) 	<ul style="list-style-type: none"> •OMRI certified (certain formulations) •Lifetime limit on applications in dairy industry
copper sulfate + lime (Bordeaux mix) FRAC na		<ul style="list-style-type: none"> •Difficult to blend 	<ul style="list-style-type: none"> •Not in NYPA guide •Fixed coppers are easier to use •OMRI certified
cyprodinil + difenoconazole (Inspire Super) FRAC 3+9	<ul style="list-style-type: none"> •Good efficacy •Rainfast •Extended post-infection activity 	<ul style="list-style-type: none"> •Limited protective activity •Only active ingredient against BR is difenoconazole •Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity) 	<ul style="list-style-type: none"> •Also effective against PM and Anthracnose (difenoconazole activity)
flutriafol (Rhyme, Topguard) FRAC 3			<ul style="list-style-type: none"> •Not discussed at meeting
kresoxim-methyl (Sovran) FRAC 11	<ul style="list-style-type: none"> •Highly effective •Rainfast 	<ul style="list-style-type: none"> •Primarily protective; little post-infection 	

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mancozeb (Manzate, Dithane) FRAC M3	<ul style="list-style-type: none"> •Very broad spectrum •Effective •Economical 	<ul style="list-style-type: none"> •Toxic to beneficial predacious mites •Restricted by juice processors; no application after bloom •Long pre-harvest interval 	<ul style="list-style-type: none"> •Mainstay of conventional disease management programs
mancozeb + zoxamide (Gavel) FRAC 22		<ul style="list-style-type: none"> •Only active ingredient against BR is mancozeb •Labelled rate insufficient; requires supplemental for reliable management •Expensive 	<ul style="list-style-type: none"> •Also effective against DM (zoxamide activity) •Low rate mancozeb
mandipropamid + difenoconazole (Revus Top) FRAC 3+40	<ul style="list-style-type: none"> •Good efficacy •Rainfast •Extended post-infection activity 	<ul style="list-style-type: none"> •Limited protective activity •Only active ingredient against BR is difenoconazole •Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity) 	<ul style="list-style-type: none"> •Also effective against DM (mandipropamid activity) •Also effective against PM and Anthracnose (difenoconazole activity)
mefenoxam + mancozeb (Ridomil Gold MZ) FRAC 4	<ul style="list-style-type: none"> •Copper content as high as some copper products 	<ul style="list-style-type: none"> •High resistance risk •Half rate mancozeb 	<ul style="list-style-type: none"> •Moderately effective for BR due to mancozeb
myclobutanil (Rally) FRAC 3	<ul style="list-style-type: none"> •Good efficacy •Rainfast •Extended post-infection activity 	<ul style="list-style-type: none"> •Limited protective activity 	<ul style="list-style-type: none"> •Also effective against PM and Anthracnose
tebuconazole + fluopyram (Luna Experience) FRAC 3+7	<ul style="list-style-type: none"> •Highly effective at full rates 	<ul style="list-style-type: none"> •Expensive •Smaller packaging would be useful to small growers •Only active ingredient against BR is tebuconazole 	<ul style="list-style-type: none"> •Also effective against PM depending on rate (tebuconazole activity) •Also effective against Bot at high label rate (fluopyram activity)
tetraconazole (Mettle) FRAC 3	<ul style="list-style-type: none"> •Good efficacy •Rainfast •Extended post-infection activity 	<ul style="list-style-type: none"> •Limited protective activity 	
thiophanate methyl (Topsin) FRAC 1		<ul style="list-style-type: none"> •High resistance risk •Not used •Efficacy unclear 	<ul style="list-style-type: none"> •Used on multiple crops •Old material

trifloxystrobin (Flint) FRAC 11	<ul style="list-style-type: none"> • Highly effective • Rainfast 	<ul style="list-style-type: none"> • Primarily protective; little post-infection • Phytotoxic to Concord 	
triflumizole (Procure, Viticure) FRAC 3		<ul style="list-style-type: none"> • Poor effective • Not used 	<ul style="list-style-type: none"> • On label? • Old material
ziram (Ziram) FRAC M3	<ul style="list-style-type: none"> • Broad spectrum • Protectant • Short pre-harvest interval • Not restricted by juice processors 	<ul style="list-style-type: none"> • Subject to removal by rain • Long re-entry interval (48 hours) • Higher toxicity; danger 	<ul style="list-style-type: none"> • Similar to mancozeb

Nonchemical (Cultural and Biological) Alternatives

Method	Pros	Cons	Comments
Plant less susceptible varieties (hybrids)	<ul style="list-style-type: none"> • Reduces material applications (half as many as vinifera) 	<ul style="list-style-type: none"> • Will not prevent 	
Canopy management and shoot thinning	<ul style="list-style-type: none"> • Improves spray penetration and air flow 	<ul style="list-style-type: none"> • Will not prevent 	
Sanitation; mummy removal	<ul style="list-style-type: none"> • Removes inoculum 		

Research Needs:

- Develop new materials *specific to organic production*; include efficacy trials.
- Independently trial new materials for BR as they are developed; include efficacy trials. Efficacy data against BR for new materials is limited even when the pest is listed on the label.
- Explore integrating BR management into organic and/or reduced-spray programs; include specific sanitation recommendations, demo plots, cordon renewal.

Regulatory Needs:

- None

Education Needs:

- Increase understanding of when infections occur, when treatment should occur, length of latency period (21 days). Increase understanding that when leaf lesions appear in mid-summer the fruit is no longer susceptible.
- Promote importance of sanitation as a management tool, particularly among organic growers and homeowners where this is the only management option.

➤ **Botrytis** (*Botrytis cinerea*)

- Not a problem for juice varieties and some wine varieties.
- Causes bunch rot of clusters and may blight blossoms, leaves, and shoots. Bunch rot can cause severe economic losses, particularly on tight-clustered cultivars. Ripe berries are susceptible to direct attack and are particularly susceptible to infection through wounds caused by insects, hail, or cracking. Infections can spread rapidly throughout the cluster, causing withered and rotted berries.
- Integrated (nutrients, canopy, site selection, fungicides) management is critical for successful disease management. A combination of the following management timings occur: 50% bloom (in wet seasons) and prior to bunch closure. This depends on variety, disease history and weather conditions.
- Fungicides labeled for Botrytis have all been shown to be extremely prone to resistance development.
- Yield loss can be up to 100% due to berry infection.

Currently Registered Pesticides (listed alphabetically)

Pesticide	Pros	Cons	Comments
<i>Aureobasidium pullulans</i> (Botector) FRAC na	<ul style="list-style-type: none"> • Among the more effective organic options 	<ul style="list-style-type: none"> • Living fungal organism; sensitive to fungicide use against other diseases • Limited efficacy 	<ul style="list-style-type: none"> • OMRI certified • Newer material
azoxystrobin (Abound, Azaka, Quadris) FRAC 11		<ul style="list-style-type: none"> • Resistance risk 	<ul style="list-style-type: none"> • Label only suppression • Also effective against DM
azoxystrobin + difenoconazole (Quadris Top) FRAC 11+3	<ul style="list-style-type: none"> • Combination product 	<ul style="list-style-type: none"> • Resistance risk • Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity) 	<ul style="list-style-type: none"> • Rates used not active for Bot (difenoconazole activity) • Also effective against DM (azoxystrobin activity) • Also effective against PM, BR, and Anthracnose (difenoconazole activity)
<i>Bacillus amyloliquefaciens</i> (Double Nickel) FRAC 44		<ul style="list-style-type: none"> • Limited data • Limited efficacy 	<ul style="list-style-type: none"> • OMRI certified
<i>Bacillus pumilis</i> (Sonata) FRAC 44		<ul style="list-style-type: none"> • Poor efficacy 	<ul style="list-style-type: none"> • OMRI certified • More likely effective under low pressure or with resistant varieties

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<i>Bacillus subtilis</i> (Serenade) FRAC 44		<ul style="list-style-type: none"> • Limited efficacy 	<ul style="list-style-type: none"> • Not in NYPA guide • OMRI certified
benzovindiflupyr (Aprovia) FRAC 7			<ul style="list-style-type: none"> • Not discussed at meeting
boscalid (Endura) FRAC 7	<ul style="list-style-type: none"> • Effective 	<ul style="list-style-type: none"> • Moderate resistance risk • Pristine preferred at similar price with broader spectrum 	<ul style="list-style-type: none"> • Also effective against PM
boscalid + pyraclostrobin (Pristine) FRAC 11+7	<ul style="list-style-type: none"> • Effective • Broader spectrum than Endura • Potential for modest pyraclostrobin contribution 	<ul style="list-style-type: none"> • Resistance common (pyraclostrobin) • Long, confusing re-entry interval • Only active ingredient against Bot is boscalid • Phytotoxic to some hybrid and native varieties (not used on Concord) 	<ul style="list-style-type: none"> • Also effective against PM (boscalid activity) • Also effective against DM and BR (pyraclostrobin activity)
captan (Captan, Captec) FRAC M4	<ul style="list-style-type: none"> • Broad spectrum • No resistance concerns • Inexpensive 	<ul style="list-style-type: none"> • Poor efficacy • Long re-entry interval • Restrictions by juice grape processors, sale to Canada • Severe phytotoxicity possible when mixed with oils (increased absorption) • Application temperature restrictions 	<ul style="list-style-type: none"> • Under scrutiny by EPA
copper sulfate + lime (Bordeaux mix) FRAC na		<ul style="list-style-type: none"> • Difficult to blend 	<ul style="list-style-type: none"> • Not in NYPA guide • Fixed coppers are easier to use • OMRI certified
cyprodinil (Vanguard) FRAC 9	<ul style="list-style-type: none"> • Very good efficacy • Protective and post-infection activity 	<ul style="list-style-type: none"> • No significant activity against other diseases • Moderate to high resistance risk • Expensive 	

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cyprodinil + difenoconazole (Inspire Super) FRAC 3+9	<ul style="list-style-type: none"> • Good efficacy • Protective and post-infection activity 	<ul style="list-style-type: none"> • Moderate to high resistance risk • Only active ingredient against Bot is cyprodinil • Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity) 	<ul style="list-style-type: none"> • Also effective against PM, BR, and Anthracnose (difenoconazole activity)
cyprodinil + fludioxinil (Switch) FRAC 9,12	<ul style="list-style-type: none"> • Very good efficacy • Some resistance risk management provided through combination products 	<ul style="list-style-type: none"> • Very expensive 	
fenhexamid (Elevate) FRAC 17	<ul style="list-style-type: none"> • Very good efficacy • Protective and post-infection activity • Zero day pre-harvest interval 	<ul style="list-style-type: none"> • Moderate resistance risk • Expensive 	
iprodione (Rovral, Meteor) FRAC 2	<ul style="list-style-type: none"> • Very good efficacy in the absence of resistance • Protective and post-infection activity 	<ul style="list-style-type: none"> • Resistance has developed but has been manageable 	
kresoxim-methyl (Sovran) FRAC 11			<ul style="list-style-type: none"> • Label only suppression
polyoxin-D (Oso, Ph-D) FRAC 19	<ul style="list-style-type: none"> • Moderately effective • Unique FRAC group; rotation option 	<ul style="list-style-type: none"> • Limited data and experience 	
pyrimethanil (Scala) FRAC 9	<ul style="list-style-type: none"> • Very good efficacy • Protective and post-infection activity 	<ul style="list-style-type: none"> • No significant activity against other diseases • Moderate to high resistance risk • Expensive 	
tebuconazole + fluopyram (Luna Experience) FRAC 3+7	<ul style="list-style-type: none"> • Very good efficacy • Some activity against other diseases 	<ul style="list-style-type: none"> • Expensive • Smaller packaging would be useful to small growers • Moderate resistance risk 	<ul style="list-style-type: none"> • Also effective against PM and BR depending on rate (tebuconazole activity)
thiophanate methyl (Topsin) FRAC 1	<ul style="list-style-type: none"> • Good efficacy in the absence of resistance 	<ul style="list-style-type: none"> • High resistance risk 	<ul style="list-style-type: none"> • Not in NYPA guide (too much resistance) • Used on multiple crops • Old material

trifloxystrobin (Flint) FRAC 11	• Good efficacy at labelled rate in the absence of resistance	• Resistance common	
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Nonchemical (Cultural and Biological) Alternatives

Method	Pros	Cons	Comments
Site selection	• Improves air flow and sunlight exposure		• Wet, humid conditions promote disease development
Plant less susceptible varieties (hybrids)	• Reduces material applications	• Will not prevent	• Open clusters and thicker skin
Canopy management and shoot thinning	• Improves spray penetration and air flow	• Will not prevent	
Balance nitrogen nutrition			• Vigorous, soft growth is more susceptible to disease

Research Needs:

- Increase understanding of relationship between crop physiology and disease development.
- Explore practical techniques for cluster loosening to reduce infection risk.
- Determine what is too wet by bunch closure to improve application timing.
- Improve risk assessment decision support systems to guide the need for fungicide application.
- Develop new materials *specific to organic production*; include efficacy trials.
- Trial new materials as they are developed; include efficacy trials.

Regulatory Needs:

- None

Education Needs:

- Promote potential for zone-limited applications to target clusters.
- Promote importance of removal of inoculum and suggest management practices (don't leave dropped fruit under vines, mechanical harvesters leave rachis as an inoculum source).
- Raise awareness of new materials as they are developed; include efficacy results.
- Promote management practices that reduce resistance development.

➤ **Phomopsis** (*Phomopsis viticola*)

- All green tissues of the vine are susceptible to infection. Severely infected leaves are misshapen, yellow, and fall from the vine prematurely. Infected rachises are brittle so portions of the cluster may fall off before harvest. Infected fruit are discolored and can drop to the ground before maturity.
- Most likely to become a problem when the fungus is allowed to build up on dead canes in the vines, especially if weather is wet during critical stages of disease development. Mechanically pruned vineyards are at particular risk of incurring economic losses.
- The critical management period for development of the cane and leaf spot phase of the disease starts at 1-inch shoot growth through the first few weeks of growth. Management for cluster and rachis infection occurs from the time clusters first become visible until after pea-sized berries are formed. Cane pruning on high cordon trained vines and scheduled renewal of cordons and trunks is recommended.
- Increasing occurrence in region as new vineyards age (old wood, inoculum build up, warmer earlier in season).
- Yield loss can be up to 40% when incidence of the disease is high.

Currently Registered Pesticides (listed alphabetically)

Pesticide	Pros	Cons	Comments
azoxystrobin (Abound, Azaka, Quadris) FRAC 11	• Post-bloom fruit rot use only	• Poor efficacy • Expensive • Not recommended for early season use	• Also effective against DM
azoxystrobin + difenoconazole (Quadris Top) FRAC 11+3	• Post-bloom fruit rot use only	• Post-bloom fruit rot use only • No data to support efficacy of difenoconazole • Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity)	• Also effective against DM (azoxystrobin activity) • Also effective against PM, BR, and Anthracnose (difenoconazole activity)
flutriafol (Rhyme, Topguard) FRAC 3			• Not discussed at meeting
boscalid + pyraclostrobin (Pristine) FRAC 11+7	• Post-bloom fruit rot use only	• Poor efficacy • Expensive • Not recommended for early season use • Long re-entry interval for some tasks • Phytotoxic to some hybrid and native varieties	• Also effective against PM and Bot (boscalid activity) • Also effective against DM and BR (pyraclostrobin activity)

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captan (Captan, Captec) FRAC M4	<ul style="list-style-type: none"> • Effective • Broad spectrum • No resistance concerns • Inexpensive 	<ul style="list-style-type: none"> • Long re-entry interval • Restrictions by juice grape processors, sale to Canada • Severe phytotoxicity possible when mixed with oils (increased absorption) • Application temperature restrictions 	<ul style="list-style-type: none"> • Under scrutiny by EPA • A standard material
copper, fixed (Champ, C-O-C-S, Kocide) FRAC M1	<ul style="list-style-type: none"> • Modest activity • Most effective current OMRI certified materials • Broad spectrum • No resistance concerns 	<ul style="list-style-type: none"> • Phytotoxic to some varieties (increased absorption) • Phytotoxicity increases with cool, slow drying conditions (increased absorption) • Accumulation in soil may eventually become toxic (Europe) 	<ul style="list-style-type: none"> • OMRI certified (certain formulations) • Lifetime limit on applications in dairy industry
copper sulfate + lime (Bordeaux mix) FRAC na		<ul style="list-style-type: none"> • Difficult to blend 	<ul style="list-style-type: none"> • Not in NYPA guide • Fixed coppers are easier to use • OMRI certified
cyprodinil + difenoconazole (Inspire Super) FRAC 3+9		<ul style="list-style-type: none"> • Poor efficacy • Not recommended for Phomopsis • Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity) 	<ul style="list-style-type: none"> • Also effective against PM, BR, and Anthracnose (difenoconazole activity)
kresoxim-methyl (Sovran) FRAC 11	<ul style="list-style-type: none"> • Post-bloom fruit rot use only 	<ul style="list-style-type: none"> • Poor efficacy • Expensive • Not recommended for early season use 	
mancozeb (Manzate, Dithane) FRAC M3	<ul style="list-style-type: none"> • Very broad spectrum • Effective • Economical 	<ul style="list-style-type: none"> • Toxic to beneficial predacious mites • Restricted by juice processors; no application after bloom • Long pre-harvest interval 	<ul style="list-style-type: none"> • Mainstay of conventional disease management programs • A standard for Phomopsis management in the Northeast

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mancozeb + zoxamide (Gavel) FRAC 22		<ul style="list-style-type: none"> • Moderately effective at labelled rate • Expensive • Not recommended over full mancozeb 	<ul style="list-style-type: none"> • Active ingredient zoxamide is DM specific • Low rate mancozeb at label rate
mandipropamid + difenoconazole (Revus Top) FRAC 3+40		<ul style="list-style-type: none"> • Poor efficacy • Not recommended for Phomopsis; mandipropamid has no activity against Phomopsis • Phytotoxic to Concord and some other hybrid and native varieties (difenoconazole activity) 	<ul style="list-style-type: none"> • Also effective against DM (mandipropamid activity) • Also effective against PM, BR, and Anthracnose (difenoconazole activity)
mefenoxam + copper (Ridomil Gold Copper) mefenoxam + mancozeb (Ridomil Gold MZ) FRAC 4		<ul style="list-style-type: none"> • Moderately effective at labelled rate • Expensive • Not recommended over only mancozeb 	<ul style="list-style-type: none"> • Low rate mancozeb at label rate
sulfur (Microthiol, Kumulus, Thiolux) FRAC M2	<ul style="list-style-type: none"> • Inexpensive 	<ul style="list-style-type: none"> • Poor efficacy in under Northeast growing conditions; too wet • Not recommended • Irritant • Detrimental to beneficial predacious mites • Phytotoxic to some native and hybrid varieties • Residue possible at harvest can affect wine quality 	<ul style="list-style-type: none"> • OMRI certified
lime sulfur FRAC M2	<ul style="list-style-type: none"> • Effective • Broad spectrum; general dormant clean-up • Useful to organic 	<ul style="list-style-type: none"> • Requires plant dormancy • Corrosive material • Efficient spray delivery is tricky on dormant vines • Damaging to equipment • Cleaning equipment is difficult • Difficult to acquire in certain areas 	<ul style="list-style-type: none"> • Dormant spray • OMRI certified

tebuconazole + fluopyram (Luna Experience) FRAC 3+7	<ul style="list-style-type: none"> •Some resistance risk management provided through combination of active ingredients 	<ul style="list-style-type: none"> •Expensive •Smaller packaging would be useful to small growers 	<ul style="list-style-type: none"> •Label only suppression • Also effective against PM and BR depending on rate (tebuconazole activity) •Also effective against Bot at high label rate (fluopyram activity)
thiophanate methyl (Topsin) FRAC 1		<ul style="list-style-type: none"> •Not recommended 	<ul style="list-style-type: none"> •Used on multiple crops •Old material
trifloxystrobin (Flint) FRAC 11	<ul style="list-style-type: none"> •Post-bloom fruit rot use only 	<ul style="list-style-type: none"> •Poor efficacy •Expensive •Not recommended for early season use 	
ziram (Ziram) FRAC M3	<ul style="list-style-type: none"> •Broad spectrum •Effective •Economical 	<ul style="list-style-type: none"> •Toxic to beneficial predacious mites 	<ul style="list-style-type: none"> •A standard for Phomopsis management in the Northeast

Nonchemical (Cultural and Biological) Alternatives

Method	Pros	Cons	Comments
Canopy management and shoot thinning	<ul style="list-style-type: none"> •Improves spray penetration and air flow 	<ul style="list-style-type: none"> •Will not prevent 	
Sanitation; removal of dead diseased wood	<ul style="list-style-type: none"> •Removes inoculum •Happens during pruning 	<ul style="list-style-type: none"> •Mechanical pruning leaves rachis as potential source of inoculum 	
Training system to reduce old wood	<ul style="list-style-type: none"> •Cane pruning common •Removes inoculum •Happens during pruning 	<ul style="list-style-type: none"> •Time required to tie cane pruned vines •Knowing which varieties respond better to cane pruning 	<ul style="list-style-type: none"> •Frequent cordon renewal is a training option

Research Needs:

- Explore cane pruning on high cordon varieties and/or scheduled renewal of cordons/trunks to reduce inoculums.
- Characterize successful sanitation techniques.
- Develop new materials *specific to organic production*; include efficacy trials. Not a high priority; cultural practices are more important for organic management.
- Trial new materials as they are developed; include efficacy trials.

Regulatory Needs:

- None

Education Needs:

- Raise awareness of optimum timing for applications for efficiency and the importance of early application.
- Promote influence of sanitation as a management tool, particularly among organic growers.
- Develop awareness of disease biology and management, particularly within new growing regions.
- Raise awareness of new materials as they are developed; include efficacy results.

Selected Comments on Other Diseases

These diseases are not considered Key Pests but do warrant special note as existing or emerging issues in Northeast. Listed alphabetically by common name.

Anthracnose (*Elsinoe ampelina*)

- Thrives in warm humid early season through bloom.
- European origin; very little information on biology in Northeast climate (temperature, humidity) and North American varieties: Does it get worse further south? Does it come from nurseries on the wood? Variety differences?
- Management programs for other diseases, including canopy management and sanitation, typically also manage anthracnose. Very little information on targeted management programs (when/what to spray).
- Increasing occurrence in region as new vineyards age (old wood, inoculum build up, warmer earlier in season). 'Marquette' seems particularly susceptible.
- There is a research need to increase understanding of biology and management.
- There is an educational need for identification factsheets.

Crown Gall (*Agrobacterium vitis*)

- Endemic presence is assumed; injuries to the vine provide opening for infection; some differences in varietal susceptibility.
- Increasing occurrence in region, exacerbated by bad winters. Notably increasing occurrence in table grapes.
- There is a research need to develop management practices: Is it better to remove infected vines or train a new trunk? Is a regular program to replace or re-trunk beneficial?

Trunk dieback (*Eutypa lata*, *Botryosphaeria* species, other)

- Problematic in mid-Atlantic climates.
- Severity varies extremely widely by age of vineyard and management practices.
- Integrated management includes sanitation, spraying pruning wounds, and double pruning to reduce inoculum.
- There is a research need to document prevalence and degree of economic loss.
- There is a research need to develop management practices appropriate to disease severity.
- There is a regulatory need for fungicides to treat pruning wounds.

Sour Rot Complex (*various bacteria, fungi, yeast*)

- Endemic presence is assumed; occurs more frequently on tight clustered varieties and during wet seasons. Spreads quickly once it starts showing in clusters. Potential wine quality reduction.
- Management includes early harvesting and hand sorting fruit in field.
- There is a research need for materials to prevent infection (antimicrobials) and spread (insecticides).
- There is a research need to increase understanding of causal organisms/complex and management.

Weeds

HRAC = Herbicide Resistance Action Committee (with mode of action classification code)

OMRI = Organic Materials Review Institute

Key Pest Name Abbreviations = see page iii

Annual Grass Weeds

Annual Broadleaf Weeds

Perennial Grass Weeds

Perennial Broadleaf Weeds

- Weed infestations occur in mixed populations including annual grasses, annual broadleaf, perennial grasses, perennial broadleaf, woody perennial and vine weeds. Weed populations vary across regions and vineyards.
- Excessive weed pressure impacts plant development and productivity by competing with the crop for water, light, and nutrients. Weeds serve as habitat for small vertebrate pests such as voles and mice that may girdle vines. Weeds can inhibit spray penetration, air circulation, and drying conditions.
- High-yield juice varieties (Concord) perform better with bare ground under vines.
- Maintaining weed free areas under wine grape vines is not practical in Northeast climate and vegetation under vines is becoming more common. Vineyard floor vegetation may be used to regulate vigor; will compete with vines for water in drought years. Vineyard floor vegetation is commonly managed by mowing or cover crops [see Nonchemical Alternatives (Cultural and Biological)].
- Management with pre-emergence and post-emergence herbicide applications under vines is common, often targeted against specific weeds. Mowing is typical for row-middle management. Bloom to fruit set is the critical period to manage weed competition. Weeds may be more tolerated later in the season.
- New plantings should be managed to remove all weeds during establishment years. Mature plantings may tolerate weeds. Bearing and non-bearing vines may tolerate different management.
- Grow tubes are strongly recommended to protect vines during herbicide applications.
- Grapes are very sensitive to herbicides; drift from neighboring applications (golf courses, turf, 2,4-D and dicamba tolerant soybeans, etc.) pose a hazard to vineyards.
- Yield losses are very difficult to quantify.

Currently Registered Pesticides: Pre-emergence (listed alphabetically)

Pesticide	Pros	Cons	Comments
dichlobenil (Casoron) HRAC L	<ul style="list-style-type: none"> • Provides long-term management of annual and perennial weeds 	<ul style="list-style-type: none"> • Requires special equipment for application • May have high potential for leaching 	<ul style="list-style-type: none"> • Must be applied before weed emergence and when soil temperatures are cool (post-harvest to pre-bud break)

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diuron (Karmex, Direx) HRAC C2	<ul style="list-style-type: none"> •Manages annual broadleaf weeds and some annual grasses 	<ul style="list-style-type: none"> •Only for vineyards >3 years old •High potential for resistance development in treated soils 	<ul style="list-style-type: none"> • Not for use on sand, loamy sand, or gravelly soils
flumioxazin (Chateau) HRAC E	<ul style="list-style-type: none"> •Pre-emergence management of most broadleaf and grass weeds 	<ul style="list-style-type: none"> •No applications within 30 days of a previous one •No application within 60 days of harvest •Application after bud break requires shielded sprayer to minimize damage to vines 	<ul style="list-style-type: none"> •Chateau SW is phasing out, WDG formulation is now being manufactured and promoted •Not recommended to combine with glyphosate in tank mix
indaziflam (Alion) HRAC L		<ul style="list-style-type: none"> •Not for nonbearing vineyards 	<ul style="list-style-type: none"> •Not commonly used
isoxaben (Gallery) HRAC L		<ul style="list-style-type: none"> •Not for bearing vineyards 	<ul style="list-style-type: none"> •Not commonly used
napropamide (Devrinol) HRAC K3			<ul style="list-style-type: none"> •Not commonly used
norflurazon (Solicam) HRAC F1			<ul style="list-style-type: none"> •Not commonly used
oryzalin (Surflan) HRAC K1			<ul style="list-style-type: none"> •Not commonly used
oxyfluorfen (Goal) HRAC E			<ul style="list-style-type: none"> •Not commonly used
pendimethalin (Prowl, Pendimax, Satellite Hydrocap) HRAC K1			<ul style="list-style-type: none"> •Not commonly used
pronamide (Kerb) HRAC K1			<ul style="list-style-type: none"> •Not commonly used •Not in NJ Guide
rimsulfuron (Matrix) HRAC B		<ul style="list-style-type: none"> •Not for nonbearing vineyards 	<ul style="list-style-type: none"> •Not commonly used

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simazine (Princep) HRAC C1		•Not for nonbearing vineyards	•Not commonly used
terbacil (Sinbar) HRAC C1		•Not for nonbearing vineyards	•Not commonly used
trifluralin (Treflan) HRAC K1			•Not commonly used •Not in NESFMG •Not in NJ Guide
trifluran + isoxaben (Snapshot) HRAC K1,L			•Not commonly used •Not in NESFMG •Not in NJ Guide

Currently Registered Pesticides: Post-emergence (listed alphabetically)

Pesticide	Pros	Cons	Comments
carfentrazone-ethyl (Aim) HRAC E			•Not commonly used •Not in NJ Guide
clethodim (Select, Arrow, Intensity) HRAC A		•Not for bearing vineyards	•Not commonly used
dichlobenil (Casaron) HRAC L			•Not commonly used •Not in NJ Guide
fluazifop-butyl (Fusilade) HRAC A			•Not commonly used
glufosinate (Rely) HRAC H	<ul style="list-style-type: none"> •Effective on most grasses and broadleaf weeds •Can provide sucker management 	<ul style="list-style-type: none"> •Avoid contact with desirable green tissue; can cause damage on young trunk tissue 	<ul style="list-style-type: none"> •Burn down application during season •Nonselective •280 formulation only (old formulation is phased out)
glyphosate (Roundup, Touchdown) HRAC G	<ul style="list-style-type: none"> •Very effective on most annual and perennial grasses and broadleaf weeds 	<ul style="list-style-type: none"> •Contact with any green tissue including young trunks may cause long-term vine damage 	<ul style="list-style-type: none"> •Dormant application recommended •Nonselective
oxyfluorfen (Goal) HRAC E			<ul style="list-style-type: none"> •Not commonly used •Not in NYPA guide •Not in NJ Guide

paraquat (Gramoxone, Firestorm) HRAC D	<ul style="list-style-type: none"> • Highly effective on grasses and broadleaf weeds that receive full contact applications 	<ul style="list-style-type: none"> • High mammalian toxicity • No residual activity • Effective sucker burndown 	<ul style="list-style-type: none"> • Nonselective • Increased attention to PPE and applicator safety necessary
pelargonic acid (Scythe) HRAC Z			<ul style="list-style-type: none"> • Not commonly used • Not in NJ Guide
pronamide (Kerb) HRAC K1		<ul style="list-style-type: none"> • Not for nonbearing vineyards 	<ul style="list-style-type: none"> • Not commonly used • Not in NESFMG
pyraflufen ethyl (Venue) HRAC E			<ul style="list-style-type: none"> • Not commonly used • Not in NYPA guide • Not in NJ Guide
sethoxydim (Poast) HRAC A			<ul style="list-style-type: none"> • Not commonly used

Nonchemical (Cultural and Biological) Alternatives

Method	Pros	Cons	Comments
Mowing (in-row/between vines)	<ul style="list-style-type: none"> • Targeted • Effective against all weeds • Does not manage root growth, weeds may still compete with vines 	<ul style="list-style-type: none"> • High labor • Potential for vine damage • Does not manage root growth, weeds may still compete with vines 	<ul style="list-style-type: none"> • Commonly performed with weed whacker or walk-behind trimmer to better guide application
Plant cover crop between rows	<ul style="list-style-type: none"> • Commonly used 	<ul style="list-style-type: none"> • No management of in-row weeds 	<ul style="list-style-type: none"> • Proper mix of species for the site and soil conditions may be difficult to determine
Cultivation	<ul style="list-style-type: none"> • Highly effective if proper equipment is used 	<ul style="list-style-type: none"> • May damage vines • May lead to soil compaction and erosion • May lead to mounding of soil at vine base that would require removal with specialized equipment 	<ul style="list-style-type: none"> • Perform early season for best efficacy
Hand removal	<ul style="list-style-type: none"> • Highly targeted 	<ul style="list-style-type: none"> • High labor cost • Ergonomics and worker safety issues 	

Biodegradable mulch	<ul style="list-style-type: none"> • Effective when applied to bare/cultivated soil 	<ul style="list-style-type: none"> • Requires use of supplemental irrigation • High cost • Provides vole habitat 	<ul style="list-style-type: none"> • Rarely used
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Research Needs:

- Explore ground cover alternatives to bare ground under vines.

Regulatory Needs:

- Desperate need for weed specialists in New England following recent retirements; New England weed specialist are desired due to different growing conditions than other Northeast regions (NJ, NY, PA).

Education Needs:

- Develop awareness of target differences for herbicides (grasses, broadleaf, sedges, perennial weeds such as bindweed, particularly among new growers.
- Clarify differences in management timing for pre-emergent and post-emergent applications.

Key Vertebrates and other pests

➤ **Vespids** (*various species*)

- Wasps, hornets, yellow jackets, honey bees.
- Feeding damage breaks skin of fruit, loss of juice, provides opening for rot, yellow jackets, other fruit flies. Stinging hazard to workers handling fruit.
- Hot dry years increase activity.
- No materials are labelled for wasps during harvest.

➤ **Birds** (*various species*)

- Starlings, other songbirds, turkeys.
- Feeding damage strips fruit; feces contaminates fruit, spreads weed seeds.
- High cordon training systems provide attractive perch above vines and fruit.
- Netting is the primary prevention technique, usually only necessary for a short period prior to harvest; early deployment creates a challenge when spraying; labor and materials are expensive; tight netting will also keep out JB.
- Inflatable scarecrows and other scare devices must be moved around and changed regularly to remain effective; Propane cannons can be vary irritating, should be shut off at night, and police notification may be necessary to offset noise complaints.

➤ **Whitetail Deer** (*Odocoileus virginianus*)

- Feed heavily on plants if not fenced out.
- Fencing is the most effective management method; taste/odor repellants may be effective (thiram, Hinder, Liquid Fence).
- Dogs in vineyard may deter; training available to keep wildlife out of sensitive areas.

➤ **Mice and Voles** (*Peromyscus sp, Microtus pennsylvanicus, Microtus pinetorum*)

- Girdle vines in winter. Minor problem in most vineyards.
- Some varieties are highly preferred. Younger vines are more vulnerable.
- Groundcover under vines provides habitat.

➤ **Raccoon and Opossum** (*Procyon lotor* and *Didelphis virginiana*)

- Climb into vine canopy, feed on ripe fruit.

➤ **Coyotes and Foxes** (*Canis latrans* and *Vulpes vulpes*)

- Chew irrigation; eat clusters.

IV. Appendices

Crop, Worker, Pest and Pest Management Timing

NOTE: Range of dates for the Northeast. Timing may occur later in the range during cooler years or further north.

➤ **Wine and Juice Production Systems**

T = Concord juice grape historical average

	Mar.		Apr.		May		June		July		Aug.		Sep.		Oct.		Nov.	
Crop Stage																		
Dormant	X	X	X	X	X	X												
Bud Break							X	X	T	X	X							
Bloom																		
Veraison							X	T	X									
Harvest																		
Dormant																		
Worker Activities																		
Pruning	X	X	X	X	X	X												
Shoot thinning																		
Shoot combing							X	X	X	X								
Cluster thinning																		
Netting																		
Harvest																		

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➤ Key Insect and Mite Pests

	Mar.			Apr.			May			June			July			Aug.			Sep.			Oct.			Nov.			
Pest Activity and Monitoring Periods																												
Grape Phylloxera								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Japanese Beetle														X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grape Berry Moth											X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chemical Application Timing																												
Grape Phylloxera								X	X	X																		
Japanese Beetle														X	X													
Grape Berry Moth*												X					X					X						
Nonchemical Management Timing –depends on method																												

*Models are often used to time applications.

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➤Key Disease Pests

C = critical timing

	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.
Pest Activity and Monitoring Periods									
Downy Mildew			X X X	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X
Powdery Mildew		X	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X
Black Rot			X X X X	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X
Botrytis				X X X X	X X X X	X X X X	X X X X	X X X X	X X X X
Phomopsis		X	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X
Chemical Application Timing									
Downy Mildew			X X X	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X
Powdery Mildew		X	X X X X	X X X X	X X X X	X X X X	X X		
Black Rot			X X X C	C C X X	C C C C				
Botrytis				X X X	X X X				
Phomopsis		C	C C C C		X X X				
Nonchemical Application Timing –depends on method									

➤Key Weeds

D = dormant application; A = as needed; C = critical timing

	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.
Establishment Years (nonbearing)									
	D D	D D X X	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X	X X X X
Bearing Years									
	D D	D D A A	A A A A	C C C C	A A A A	A A A A	A A A A	A A A A	A A A A

Pesticide Efficacy

➤ **Insect and Mite Pests**

Tables adapted from 2017-2018 New England Small Fruit Management Guide.

Insecticide/ Miticide	IRAC Group ^a	Brown Marmorated Stinkbug	Climbing Cutworm	*Grape Berry Moth	Grape Cane Girdler [†]	Grape Flea Beetle	*Grape Phylloxera	*Japanese Beetle	Leaf hoppers	Red banded Leaf roller	Spider Mites	Spot ted Win g Drosophila
Actara	4A	++ ^b	0	0	0	0	0	++	++	0	0	0
Acramite	4A	0	0	0	0	0	0	0	0	0	+++	0
Admire Pro	4A	++	0	0	0/+	0	++	+	+++	0	0	+
‡ Agri-Mek	6	0	0	++	0	0	0	0	+	0	++	0
Altacor	28	?	++	+++	++/?	+	0	++	0	++	0	?
Apollo	10A	0	0	0	0	0	0	0	0	0	++	0
Assail	4A	?	?	0	++	?	++	++	+++	?	0	+++
Avaunt	22A	?	?	++	++	?	?	++	+	?	0	?
⊗ Aza-direct	18B	?	?	?	?	?	?	?	?	?	?	?
‡ Baythroid	3A	?	++	+++	+++	++	?	+++	+++	++	0	+++
Belt	28	?	++	+++	++	++	0	++	0	++	0	?
⊗ Biobit	11	0	?	+	0	0	0	0	0	?	0	0
‡ Brigade	3	++	++	+++	+++	++	?	+++	+++	++	?	+++
Closer SC	4C	?	?	?	?	?	?	?	?	?	?	?
‡ Danitol	3	++	++	+++	+++	++	++	++	+++	++	++	+++
Delegate	5	?	?	+++	0	?	0	0	0	+++	0	+++
Des-X	UN	0	0	0	0	0	++	0	++	0	0	?
⊗ DiPel	11	0	?	+	0	0	0	0	0	?	0	0
⊗ Entrust	5	?	?	?	?	?	?	?	?	?	?	++
Fujimite	21	0	0	0	0	0	0	0	+	0	+++	0
⊗ Grandevo	UN	?	?	?	?	?	?	?	?	?	?	?
Imidan	1B	?	++	+++	+++	++	?	+++	++	+++	0	?
Intrepid	18	?	0	+++	0	0	0	0	0	?	0	?
‡ Leverage	3,4A	++	++	+++	+++	++	?	+++	+++	++	?	+++
Movento	23	?	0	0	0	0	+++	0	0	0	+	?
⊗ M-Pede	0	0	0	++	0	0	0	0	++	?	0	?
‡ Mustang Max	3	0	0	+++	0	0	0	++	+++	0	0	+++
Nealta	25	0	0	0	0	0	0	0	0	0	++	0
⊗ Neemix	18B	?	?	?	?	?	?	?	?	?	?	?
Nexter	21A	0	0	0	0	0	0	0	++	0	+++	0
Onager	10A	0	0	0	0	0	0	0	0	0	++	0
Pasada	4A	++	0	0	0/+	0	++	+	+++	0	0	+
Platinum	4A	++	0	0	0/+	0	++	+	+++	0	0	+

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Portal	21A	0	0	0	0	0	0	0	++	0	+++	0
⊗ Pyganic	3	?	?	?	?	?	?	?	+	?	?	+
Scorpion	4A	+++	0	0	0	0	0	0	+++	0	0	?
Sevin	1A	?	+++	+++	++	+++	0	+++	+++	+	0	++
Tourismo	28/ 16	++	0	+++	++	0	0	0	0	++	0	?
⊗ Trilogy	18B	?	?	?	?	?	?	?	?	?	?	?
Vendex	12B	0	0	0	0	0	0	0	0	0	+++	0
⊗ Venerate	UN	?	?	?	?	?	?	?	?	?	?	?
Venom	4A	+++	0	0	0	0	0	0	+++	0	0	?
Voliam flexi	4A	?	++	+++	++	++	++	++	+++	++	0	?
Zeal	10C	0	0	0	0	0	0	0	0	0	+++	0

*Key Pests

a. Chemistry of insecticides by activity groups: 1A=carbamates; 1B=organophosphates; 2A=chlorinated cyclodienes; 3=pyrethrins and synthetic pyrethroids; 4A=neonicotinoids; 5=spinosyns; 7=juvenile hormone mimics; 11=Bt microbials; 18=molting disruptors; 21=botanical electron transport inhibitors; 22=voltage dependent sodium channel blocker.

b. 0=not effective/not labeled, += slightly effective, ++= moderately effective, +++=highly effective

‡Restricted use material; pesticide applicator's license required.

⊗OMRI listed for organic production; see www.omri.org for details.

➤Disease Pests

Tables adapted from 2017-2018 New England Small Fruit Management Guide.

Fungicide	FRAC Group ^a	Anthraco nose	Bitter Rot	*Black Rot	*Botryti s Rot	*Down y Mildew	*Phom opis Cane and Leaf Spot	*Powde ry Mildew
Abound/Azaka	11	++++ ^b	?	++++	+	++++	++	++++
Aliette	33	0	0	0	0	+++	0	0
Aprovia	7	++	?	++	+	0	?	++++
Armcarb	-	?	0	0	0	0	0	++
Bordeaux mix	-	?	?	++	++	++++	++	+++
Botector	-	?	?	0	++/++++	0	0	0
Captan/Captec	M4	++	++	+	+	+++	++++	0
Copper & lime	M1	?	?	+	0	+++	+	++
Double Nickel	44	?	?	?	++	?	?	++
Elevate	17	?	0	0	++++	0	0	+
Elite	3	++	0	++++	0	0	0	+++
Endura	7	+++	0	0	++/++++	0	0	++++
Fixed Copper	M1	?	+	+	0	+++	+	++
Flint	11	?	0	++++	++/++++	+	++	++++
Gavel	22	0	0	++	0	+++	++	+
Inspire Super	3,9	++	?	++++	+++	0	0/+?	++++
⊗ JMS Stylet Oil	-	?	0	0	0	0	0	+++
⊗ Kaligreen/ Nutrol/Armcarb	UN	0	0	0	0	0	0	++
Luna Experience	7,3	?	?	+++/+	+++/+	0	+	++++
Mancozeb/ Dithane	M3	+++	++	+++	0	+++	++++	+
⊗ Milstop	UN	0	0	0	0	?	0	++
Mettle	3	+++	0	++++	0	0	?	+++
Oso/Ph-D	19	?	?	?	++	0	?	++
Presidio	43	0	0	0	0	++++	0	0
Pristine	11,7	+++	?	++++	++/+++	++++	++	++++
Procure/Viticure	3	?	0	++	0	0	0	+++
ProPhyt/ Phostrol	33	?	0	0	0	+++	0	0
Quadris Top	11,3	+++	?	++++	+	++++	++	++++
Quintec	13	0	0	0	0	0	0	++++
Rally	3	+++	0	++++	0	0	0	+++
Ranman	21	0	0	0	0	+++	0	0
Reason	11	0	0	0	0	++++	0	0
Revus	40	0	0	0	0	++++	0	0
Revus Top	3,40	++	0	++++	0	++++	0/+?	++++
Rhyme	3	?	?	++++	0	0	0	+++

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Ridomil	4	?	++	++	0	++++	+	+
Rovral	2	?	0	0	++++	0	0	0
Scala	9	?	0	0	++++	0	0	+
⊗ Serenade	-	?	?	0	+	0	0	0
Sonata	-	?	?	?	+	+	?	++
Sovran	11	++++	0	++++	++	++	++	++++
Sulfur	M2	?	0	0	0	0	+	+++
Topguard	3,11	?	?	++++	+	++	+	+++
Topsin-M	1	+++	++	+	++ ⁱ	0	++	+++
Torino	U6	?	?	0	0	0	0	+++
Trilogy	IRAC 18B	?	?	?	?	?	?	++
Vanguard	9	?	0	0	+++	0	0	+
Vintage	3	++	0	++	0	0	0	+++
Vivando	U8	0	0	0	0	0	0	++++
Zapro	45,40	?	?	0	0	++++	0	0
Ziram	M3	++	0	+++	0	++	++++	0

***Key Pests**

a. Chemistry of fungicides by activity groups: 1=benzimidazoles and thiophanates; 2=dicarboximides; 3=demethylation inhibitors (includes triazoles; 4=acylalanines; 7=carboxamides; 9=anilinopyrimidines; 11=strobilurins; 12=phenylpyrroles; 13=quinolines; 17=hydroxyanilides; 33=unknown (phosphonates); M=chemical groups with multisite activity; UN=unknown or uncertain. Fungicides with 2 activity groups contain active ingredients with different modes of action.

b. 0=not effective or not labeled, +=slight, ++=moderate, +++=good, ++++=excellent, ?=unknown.

⊗ OMRI listed for organic production; see www.omri.org for details.

➤Weeds

Tables adapted from 2015 Commercial Grape Pest Control Recommendations for New Jersey.*

Pre-emergence														
	Ali on	Cha te au	De vri nol	Gal ler y	Go al 2XL /G alig an	Kar me x	Ma tri x FN V	Nor osa c/C ase oro n	Pri nce p	Pro wl	Sin bar	Soli ca m	Sur fla n	Vel par
SUMMER ANNUAL														
Barnyardgrass	G ^a	F	G	N	F	G	G	F/G	F	G	G	G	G	G
Crabgrass, large	G	F	G	N	F	F/G	F	F/G	P/F	G	G	G	G	G
Fall Panicum	G	F	G	N	F	G	F	F/G	F	G	G	G	G	G
Foxtail sp.	G	F	G	N	F	G	G	F/G	G	G	G	G	G	G
Goosegrass	G	-	G	N	-	F/G	P	F/G	F/G	G	G	G	G	G
Johnsongrass (seedlings)	-	-	G	N	-	N	-	F/G	P	G	-	-	G	-
Annual Sedge	-	P	P/F	N	P	F/G	G	G	F/G	P	G	F/G	N	-
Carpetweed	G	G	G	F	G	G	-	-	-	G	G	P	F/G	G
Cocklebur, common	-	G	N	-	-	-	F/G	-	F/G	-	-	P	N	-
Galinsoga, hairy	G	G	F/P	G	G	G	-	-	G	N	G	-	N	G
Jimsonweed	G	G	N	G	G	G	F	-	G	N	G	F	N	G
Lambsquarter, common	F/G	G	F/G	G	G	G	F	G	G	F/G	G	F	F/G	F/G
Morning Glory sp.	F/G	G	N	G	G	G	F	-	G	P	G	-	N	F/G
Nightshade, Eastern Black	G	G	N	G	G	G	P	-	G	-	G	-	P	G
Shepherds Purse	G	G	-	G	G	G	G	G	G	-	G	-	N	G
Pigweed sp.	G	G	G	G	G	G	G	G	F	F/G	F	F	F/G	G
Purslane, common	G	G	F	G	G	G	F	-	G	F/G	G	G	F/G	G
Ragweed, common	F/G	G	P/F	G	G	G	P	G	G	-	G	F/G	N	F/G
Smartweed, Pennsylvania	F/G	G	P	G	G	F	P/F	-	G	-	G	-	P	F/G
Velvetleaf	G	G	N	G	G	G	F	-	-	F/G	G	F	P	G
WINTER ANNUAL														
Annual Bluegrass	G	P/F	G	G	P/F	G	F	F	G	G	F/G	G	G	G
Annual Bromegrass	G	P/F	G	G	P/F	F	-	G	F	G	F/G	G	G	G
Chickweed sp.	G	G	F	G	G	G	G	G	G	F	G	F	F	G

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Corn Chamomile	G	G	P	G	G	G	-	G	G	P	G	F	P	G
Groundsel	G	G	N	G	G	P	G	G	P	N	P	P	N	-
Henbit	G	G	P	G	G	G	G	G	G	P	G	F	P	G
Horseweed	G	G	N	-	G	G	P/F	G	G	P	G	P/F	P	F/G
Mustard sp.	G	G	P	G	G	G	G	G	G	P	G	F	P	G
PERENNIAL														
Bermudagrass	N	N	N	N	N	N	P	F	N	N	N	P	N	P
Quackgrass	N	N	N	N	N	P	F	F	P	P	P	F	P	F
Yellow Nutsedge	P	P	P	P	P	P	F/G	F/G	P	P	P	F	P	F
Aster sp.	N	P	N	P	P	P	P	F/G	P	N	P	P	N	F/G
Bindweed sp.	N	P	N	P	P	P	P	F/G	P	N	P	P	N	F
Canada Thistle	N	P	N	P	P	P	P	F/G	P	N	P	P	N	F
Goldenrod sp.	N	P	N	P	P	P	P	F/G	P	N	P	P	N	F
Hemp Dogbane	N	P	N	P	P	P	P	F/G	P	N	P	P	N	F
Red Sorrel	-	P/F	N	P	P/F	P	P	F/G	P	N	P	P	N	F
Mulberry	N	N	N	N	N	N	P	P	N	N	N	P	N	P
Poison Ivy	N	N	N	N	N	N	P	P	N	N	N	P	N	P
Virginia Creeper	N	N	N	N	N	N	P	P	N	N	N	P	N	P

Post-emergence							
	Fusilade DX	Glyphosate products	Kerb	Paraquat products	Poast	Rely 200	Select
SUMMER ANNUAL							
Barnyardgrass	G ^a	G	G	F/G	G	G	G
Crabgrass, large	F/G	G	G	F/G	G	G	G
Fall Panicum	G	G	G	F/G	G	G	G
Foxtail sp.	G	G	G	G	G	G	G
Goosegrass	G	G	G	F/G	G	G	G
Johnsongrass (seedlings)	G	G	-	-	G	F/G	G
Annual Sedge	N	F	N	G	N	F/G	N
Carpetweed	N	G	G	-	N	G	N
Cocklebur, common	N	G	N	G	N	G	N
Galinsoga, hairy	N	G	P	G	N	G	N
Jimsonweed	N	G	N	G	N	G	N
Lambsquarter, common	N	G	G	F/G	N	G	N

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Morning Glory sp.	N	F	-	F/G	N	F	N
Nightshade, Eastern Black	N	G	-	-	N	F/G	N
Shepherds Purse	N	G	-	-	N	G	N
Pigweed sp.	N	G	G	G	N	G	N
Purslane, common	N	G	G	F/G	N	G	N
Ragweed, common	N	F	P	G	N	F	N
Smartweed, Pennsylvania	N	G	-	-	N	G	N
Velvetleaf	N	G	P	-	N	G	N
WINTER ANNUAL							
Annual Bluegrass	P	G	G	G	P	G	G
Annual Bromegrass	G	G	G	G	G	G	G
Chickweed sp.	N	G	N	G	N	G	N
Corn Chamomile	N	G	N	G	N	G	N
Groundsel	N	G	N	F	N	G	N
Henbit	N	G	N	G	N	G	N
Horseweed	N	P/G	N	F	N	G	N
Mustard sp.	N	G	N	G	N	G	N
PERENNIAL							
Bermudagrass	G	F	P	P	G	P/F	G
Quackgrass	G	G	G	P	G	P/F	G
Yellow Nutsedge	N	G	N	P	N	P/F	N
Aster sp.	N	G	N	P	N	P/F	N
Bindweed sp.	N	G	N	P	N	P/F	N
Canada Thistle	N	G	N	P	N	P/F	N
Goldenrod sp.	N	G	N	P	N	P/F	N
Hemp Dogbane	N	G	N	P	N	P/F	N
Red Sorrel	N	G	N	P	N	P/F	N
Mulberry	N	G	N	P	N	P	N
Poison Ivy	N	G	N	P	N	P	N
Virginia Creeper	N	G	N	P	N	P	N

*These ratings indicate ONLY relative effectiveness in tests conducted by the University of Maryland and Rutgers, The State university of New Jersey, on coarse- to medium-textured soils. Actual performance may be better or worse than indicated in this table.

a. G=Good, F=Fair, P=Poor, N=None, -=insufficient data

New Pest Management Technologies

IR-4 'Probable Future Registrations' and 'Studies in Registration Process' pesticides used on GRAPE and GRAPE (CONCORD) (13-07F = SMALL FRUIT VINE CLIMBING SUBGROUP, EXCEPT FUZZY KIWIFRUIT)

Tables adapted from database search results:

http://ir4.rutgers.edu/FoodUse/FutureRegi_1.cfm?simple=5

http://ir4.rutgers.edu/FoodUse/RegiProcess_1.cfm?simple=2

➤ **Insect and Mite Pests**

Pnum Pesticide [Manufacturer]	Project Status	Req States	Pest/Reason for need:
Probable Future Registrations			
1953 PERMETHRIN [ADAMA, AMVAC, FMC, UPI]	ALL DATA RECEIVED AT HQ	WA NY PA MI	GRAPE BERRY MOTH, GRAPE LEAFHOPPER, JAPANESE BEETLE
11413 SPINETORAM [DOWAGR]	ALL DATA RECEIVED AT HQ	KY NM CO PA NJ	SPOTTED WING DROSOPHILA (SWD)

➤ **Disease Pests**

Pnum Pesticide [Manufacturer]	Project Status	Req States	Pest/Reason for need:
Studies in the Registration Process			
9175 FLUTIANIL [LANDIS,OATAGRIO]	NOTICE OF FILING ISSUED/PROPOSAL	CA NM	POWDERY MILDEW

➤ **Weeds**

Pnum Pesticide [Manufacturer]	Project Status	Req States	Pest/Reason for need:
Probable Future Registrations			
10031 QUIZALOFOP [DUPONT, GOWAN]	FINAL REPORT SIGNED; READY FOR SUBMISSION	NY KY	GRASSES, JOHNSONGRASS

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