

Organic Grape Production

Organic vs. Conventional

- Growing costs were 69 – 91% higher for organic
 - High weed control cost was a major factor
 - (based on a 5 yr. study @ Cornell Univ.)
- Estimated establishment cost > \$10,000/acre
- Annual production cost (excluding harvest) of ~\$2,000/acre
- 1st significant crop about 4th year of vineyard life

Feasibility of Organic Production (most to least)



Muscadines

American Bunch

French American Hybrids

Seedless

Vitis vinifera

Conventional/Organic Practices

- Site selection
- Site development
- Training systems
- Pruning
- Planting techniques

Vineyard Site Score Sheet

- Accessibility
- Elevation
- Direction of slope
- Degree of slope
- Soil Characteristics
- Water
- Wildlife
- Adjacent agricultural operations

Vineyard Site Selection

- **Ease of getting crop to winery:**
 - Distance, quality of roads
- **Elevation:**
 - Frost, disease protection
- **Direction of Slope:**
- **Soils:**
 - Rooting depth
 - Water drainage, internal & surface
 - Fertility
- **Water:**
 - Quantity, quality

Functions of the Trellis

The trellis is a long-term investment. It should be built to last the life of the vineyard

- Support the vine and the crop
- Expose fruit and foliage to sunlight
- Open canopy to air movement and spray penetration
- Facilitate ease of vineyard operations
 - Pruning, thinning, pest control, harvest

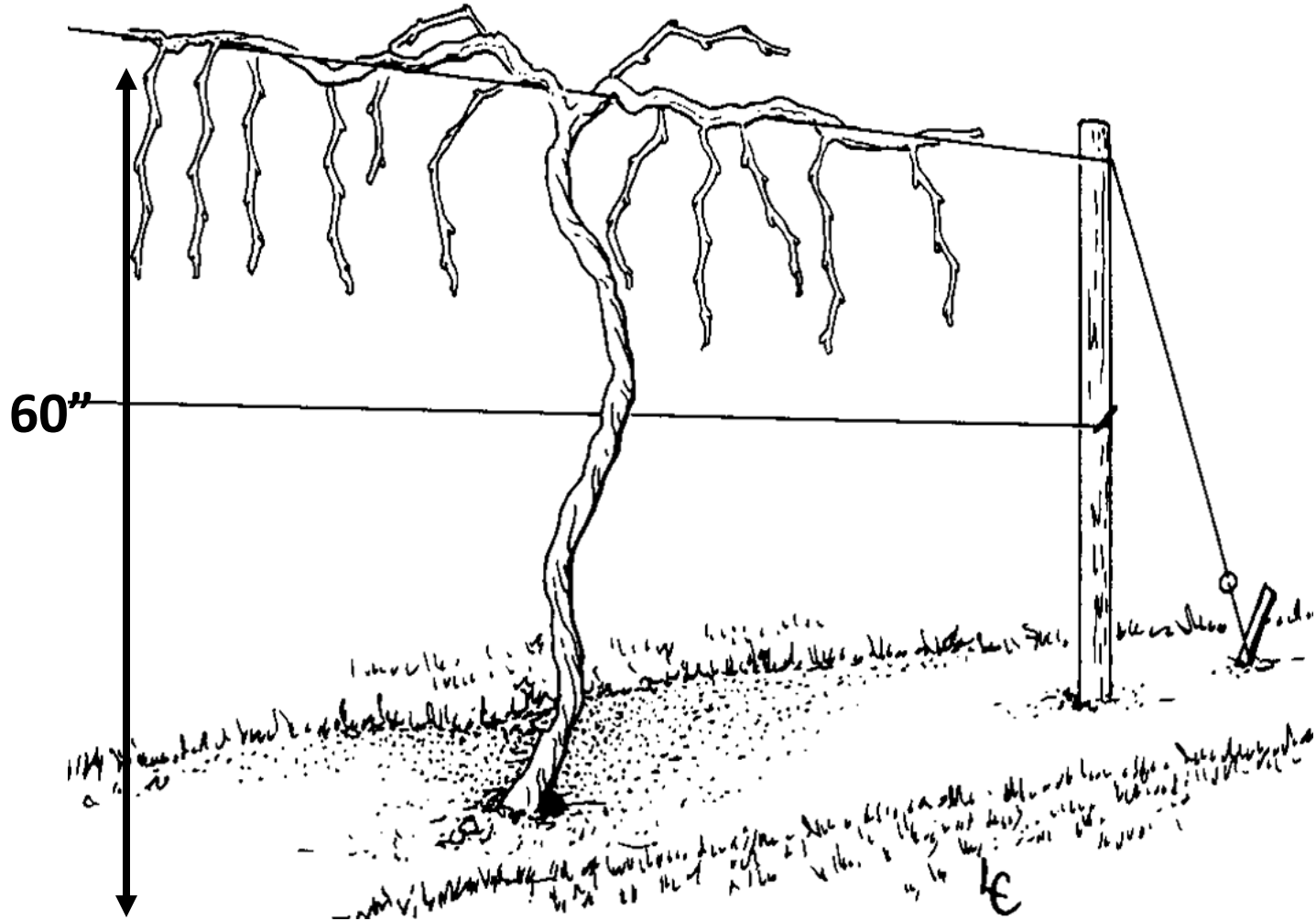
Factors influencing training system & trellis design to be used in the vineyard

- Type of grape (Amer. Bunch, Fr. Amer. Hybrid, V. vinifera, muscadine)
- Vine spacing (inrow & between row)
- Row orientation
- Soil fertility
- Management capabilities
- Available labor (both the amount & capabilities)
- Establishment costs
- Equipment requirement
- Mechanization?

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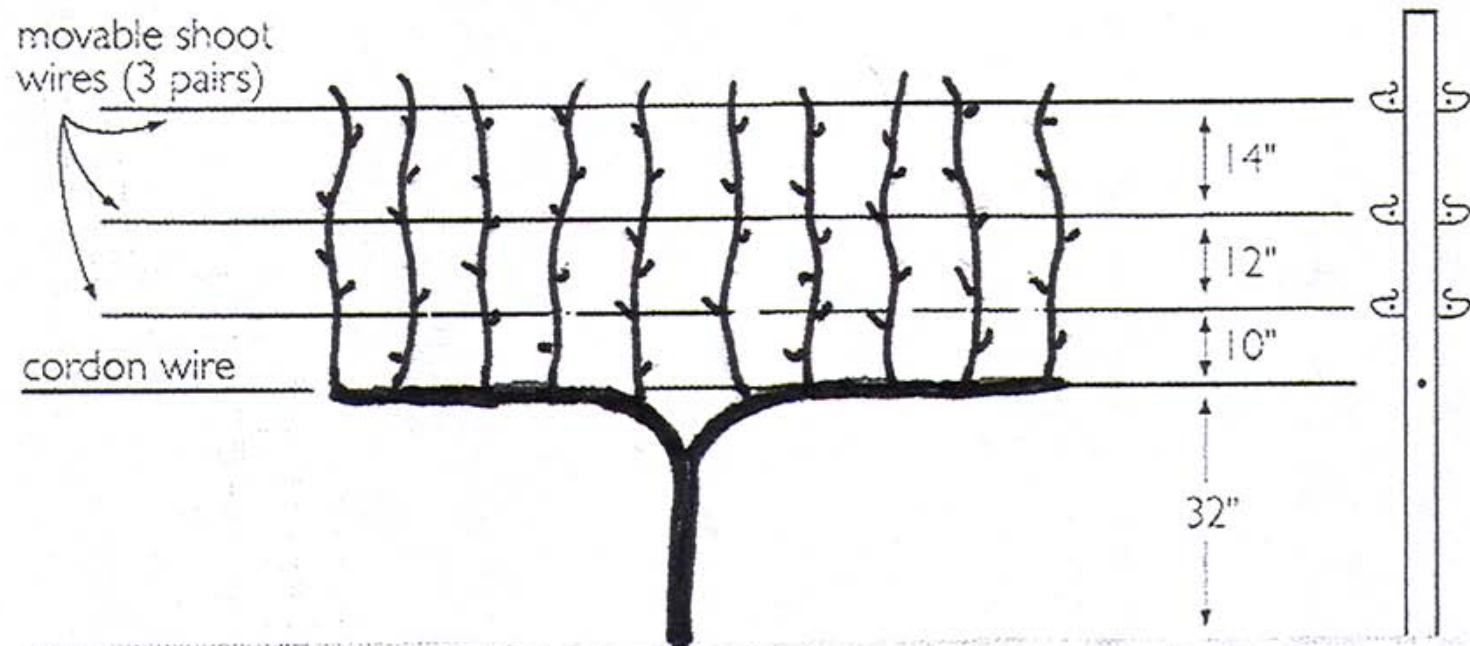
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Bilateral (Single Curtain) Cordon



Vertical-shoot-positioned Trellis (VSP)

Vertical-shoot-positioned trellis (VSP)



Why Prune?

- **Facilitate better sunlight penetration, air flow and spray coverage throughout the canopy**
- **Promote growth in desired areas**
 - **Keep the crop close to the trunk or cordons**
- **Promote development of wood for future crops**
- **Remove dead, broken or diseased canes**
- **Remove unfruitful canes**
- **Adjust crop size**

Disease Management

- Cultural strategies
 - Cultivar selection
 - Site selection & development
 - Training
 - Pruning
- Organically acceptable mineral-based fungicides
 - Sulfur, Bordeaux mixture

Mite & Insect Control

- Biological
- Cultural
- Phermonal controls

Weed Control

- Cover crops
- Mulching
- Mechanical cultivation

Fertility

- Variety of organically acceptable materials and strategies

In general, all *Vitis vinifera* cultivars tend to be highly susceptible to all the American grape diseases and pests and attempts to produce a crop in the East without the use of fungicides will be very difficult.

Black Rot Control (Organic)

- Resistant varieties:
 - Chambourcin, Cynthiana (Norton), Elvira, Ives, Cascade
- Site Selection:
 - Elevation, sunlight
- Sanitation:
 - Removal of mummified fruit
- Protectant sprays
 - Liquid copper formulations, Bordeaux mix
 - Begin sprays when 1st vegetative shoots are 3 to 6 inches long & continue until berries reach about 5% sugar



Black Rot Infection Period Prediction Table

- Temperature (°F)
-

50
55
60
65
70
75
80
85
90

- Minimum leaf wetness duration in hours for light infection
-

24
12
9
8
7
7
6
9
12

Powdery Mildew (*Uncinula necator*)

- Overwinters inside dormant buds or on the surface of the vine
- Cultural practices that may reduce severity:
 - Sunlight exposure
 - Row orientation (north – south)
 - Air circulation (high trellis)
- Organic controls
 - Sulfur (avoid sensitive varieties)
 - Sodium & potassium bicarbonate
 - AQ10 biofungicide (mfg by Ecogen)



Downy Mildew (*Plasmopara viticola*)

- Usually overwinters as spores in fallen leaves
 - May survive in buds as mycelium in regions having mild winters
- Favored by all factors that increase the moisture content of soil, air, and host plants
 - Rain is the principal factor promoting epidemics
 - Most serious epidemics occur when a wet winter is followed by a wet spring & a warm summer with intermittent rainstorms every 8 – 15 days

Downy Mildew

Preventive management practices:

- Draining soils

- Reducing overwintering sources of inoculum

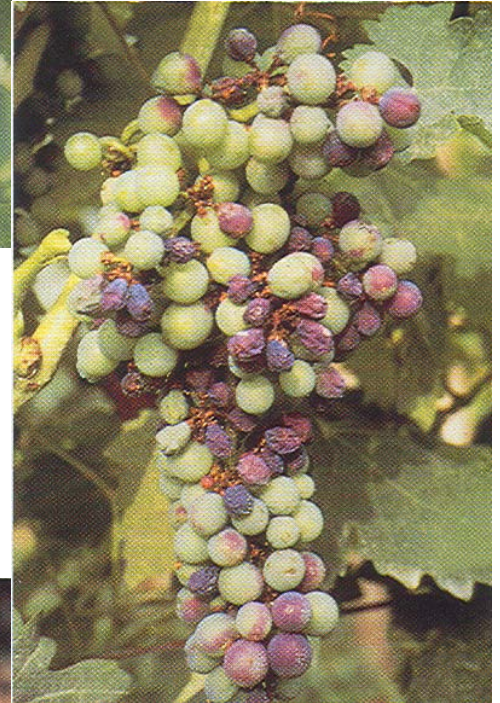
- Pruning out the ends of infected shoots

 - None of these are sufficient for highly susceptible cultivars

Organic fungicides:

- Liquid copper

- Bordeaux mix



Phomopsis Cane & Leaf Spot (*Phomopsis viticola*)

- Overwinters in the bark of canes
- Can be especially severe in early spring when rain occurs for several days
- Inoculum levels build with cool, wet springs
- Susceptibility varies among cultivars
- Control:
 - Combination of sanitation measures & the use of copper fungicides
 - Pruning & removal of infected wood

Botrytis Bunch Rot (*Botrytis cinerea*)

Especially troublesome in wet or humid areas

More of a problem with cultivars having tight clusters

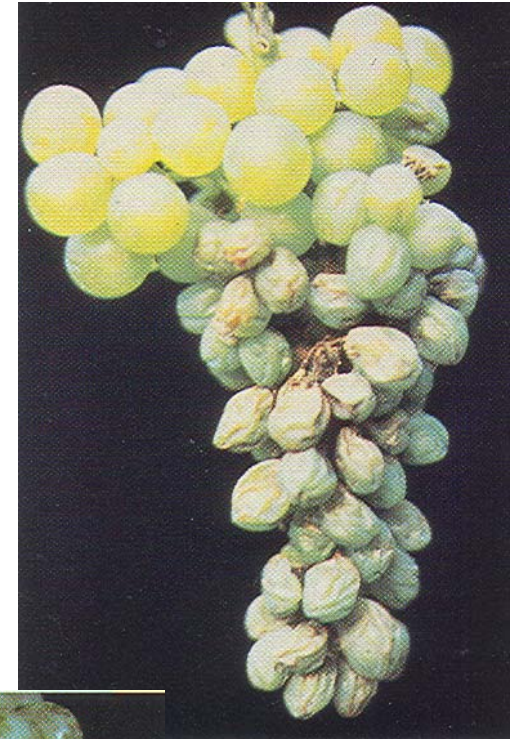
Control:

Leaf removal around clusters

Reduce fertilization levels

Beneficial fungicide
Trichoderma harzianum
use

Bordeaux mix & sulfur-containing fungicides are ineffective



Grape Organic Insecticides

- Superior oil
- *Bacillus thuringensis* (Bt)
- Entrust
- Isomate GBM-Plus (mating disruption)
- Surround
- JMS Stylet oil

Organic grape pest management

- Bud feeders
- Berry feeders
- Leaf feeders
- Root feeders

Bud Feeders

- Climbing cutworms
 - Entrust, Intrepid
 - Bt?
- Grape flea beetle
 - Site selection
 - Habitat modification?



Berry Feeders

- Grape berry moth
- Redbanded leafroller
- Yellowjackets



Grape Berry Moth

- Mating disruption
- Entrust
- Bt?
- Intrepid (almost category)
- Site selection
- Habitat modification



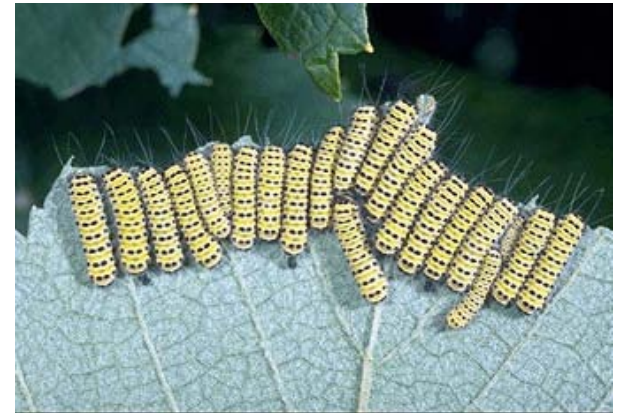
Grape Berry Moth (*Endopiza viteana*)

- Control:
 - Cultural practices to reduce overwintering populations
 - Plowing or cultivating to bury cocoons containing overwintering larvae
 - Biological agent – egg parasite (*Trichogramma minutum*)
 - Sex-pheromone impregnated twist ties (mating disruption)

Leaf Feeders



- European red mite
- Adult grape flea beetle
- Grape skeletonizer
- Grape leafhopper



Leafhoppers

- Control:
 - Clean cultivation in & around the vineyard
 - Helps to reduce overwintering adults in weed residue
 - Organic insecticides:
 - insecticidal soap, sabadilla
 - Tiny parasitoid wasps (*Anagrus epos*) allowed to build up populations on another leafhopper species

Mites

- Cultural control:
 - Proper irrigation
 - Dust reduction along roadwayseen
- Organic miticides:
 - Sulfur (may disrupt beneficial mites & other natural enemies)
- Beneficial predatory mite (*Metaseiulus occidentalis*) has been shown to reduce spider mite population in California
 - Maintaining a ground cover is beneficial to predatory mites

Grape Phylloxera
(*Dakulosphaira*
***vitifoliae*)**

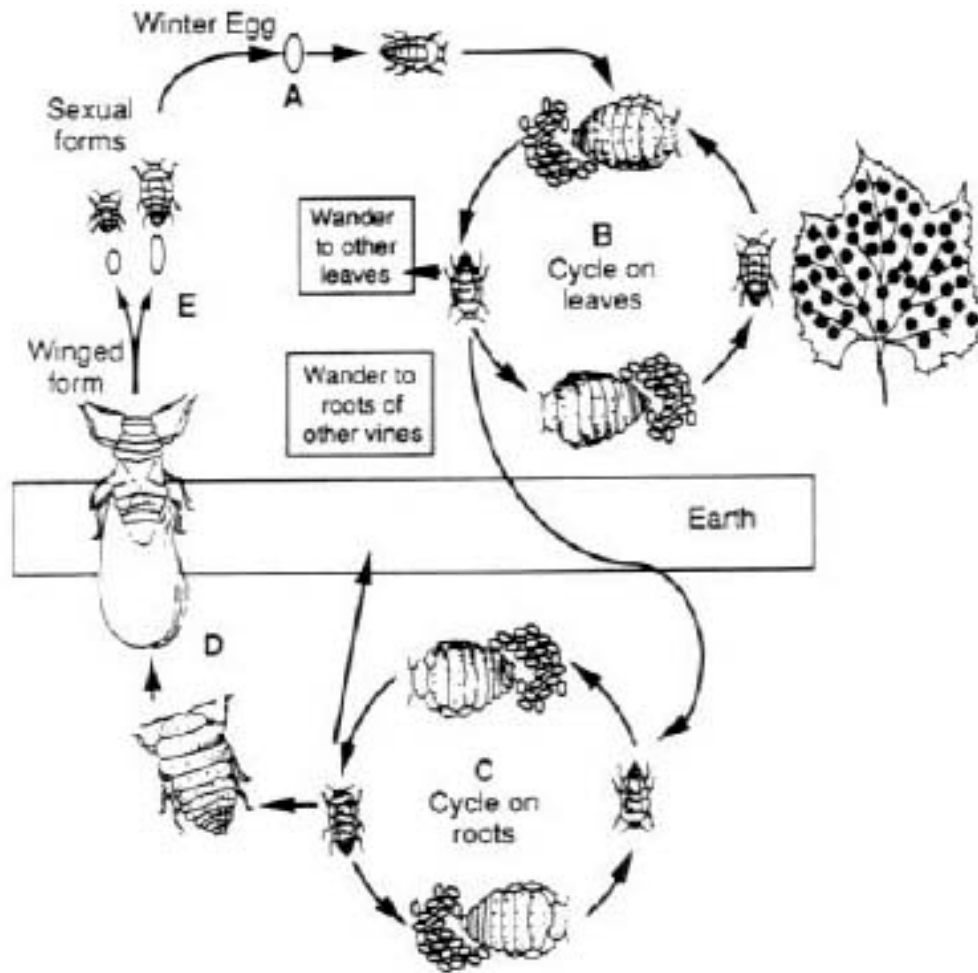
Aerial, leaf-galling
form:

Not usually
serious enough to
merit control
measures

Subterranean root-
feeding form:

Most serious
Use of resistant
rootstocks





Damage Symptoms

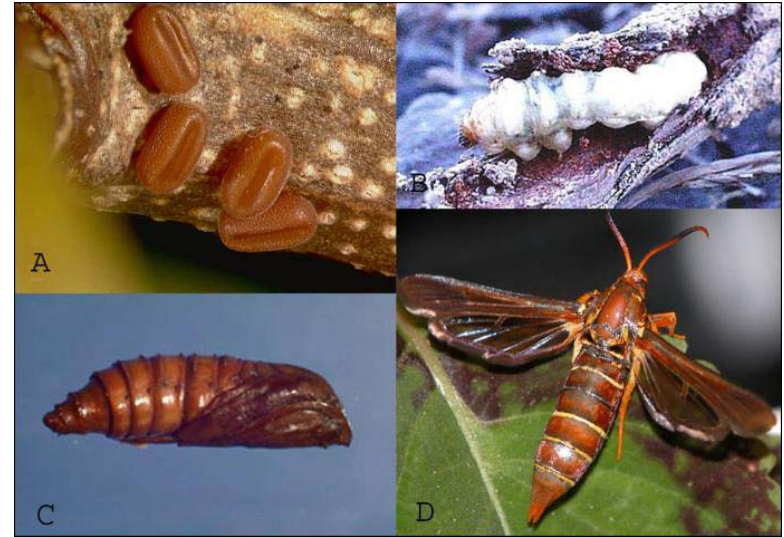
The insect forms galls on the leaves and roots of grapevines. The vine will die if its roots become heavily infested with phylloxera. If leaves become heavily infested, premature defoliation and retarded shoot growth may result.

Caterpillars

- Includes orange tortix, omnivorous leafroller, & grape leaf skeletonizer
- Control:
 - *Bacillus thuringiensis* (naturally occurring bacterium)
 - Trade names:
 - Dipel™
 - Thuricide™
 - Javelin™

Root Feeders

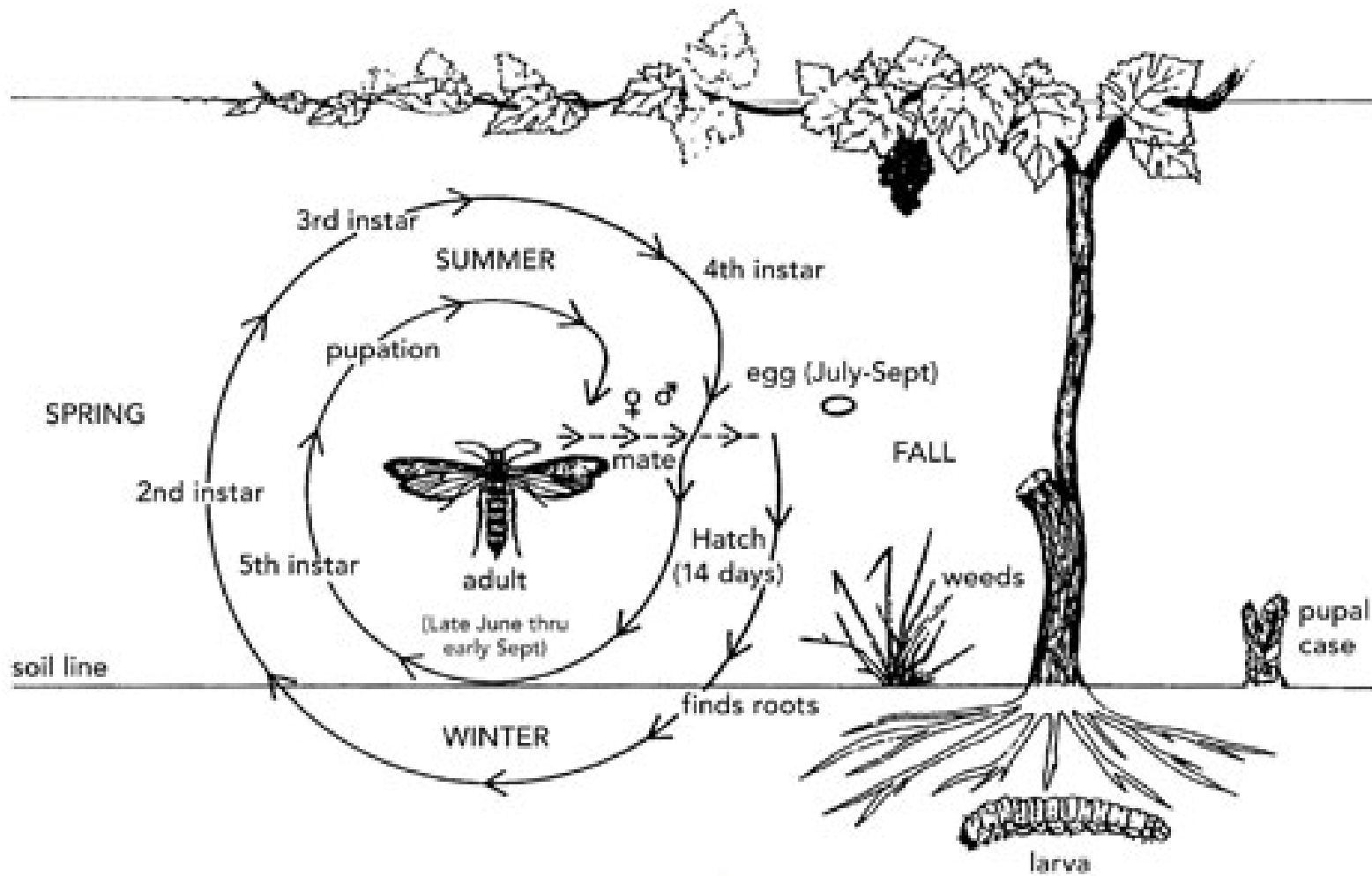
- Grape root borer
 - Weed control
 - Nematodes?
 - Habitat modification
- Grape Rootworm
 - Aim at foliar feeding adults



LIFE CYCLE

GRAPE ROOT BORER

Vitacea polistiformis (Harris)



Summary

- Organic grape production in the East is:
 - Complicated by disease and insect pressure
 - Types of cultivars adapted to Eastern climates
- Novel marketing techniques may be needed to make profitable production in the East a possibility