clones of both rootstocks and scion varieties that feature disease resistance and absense of viruses as important criteria/attributes for clonal material selection

- introduction of EU wide plant passport system in early 1990s with its concomitant source inspections and ELISA (Enzyme-Linked Immuno Sorbent Assay) testing for viruses has increased quality of grafted wines
- better hygiene in grafting nurseries lessened chance of viruses and diseases eg Eutypa lata being transmitted to destination vineyards
- better trellising/training methods: those suited for mechanization allowed more regular spraying and vineyards taken better care of s.t. measures taken promptly and efficiently
- more advanced tractors (four-wheel drive, AC'd) and spraying equipment (nozzles that produce smaller evenly sized droplets which creates greater overall surface of contact between chemical in droplets and plants thus less product used to greater effect, low volume and recirculation sprayers that catch, filter, and recirculate spray that misses target) greatly improved efficiency and productivity
- greater realization of the important role of canopy management in overcoming disease: heat, light, and air are enemies of disease; open canopy and no more than 3-4 leaf layers and good air drainage through and beneath would dry out vines and keep fungal diseases at bay

the spectrum of pests, diseases, etc. depends on many factors: location, climate, weather of a vintage, variety, clone, rootstock, economics, wine style, quality:

- a tradeoff between cost and reward and consideration has to be given to the economics of production: increased use of machine harvesters necessitate clean crops to be not penalized at the winery door as manual pickers could be instructed to pick only clean grapes, thus noticeable annual differences depending on rainfall, sunshine, heat levels when machine harvested
- some diseases are carried from plant to plant by insects (vectors) and controlling these by spraying insecticide or habitat reduction may well play a part in controling seemingly unconnected maladies
- other factors: exposure to prevailing winds, vineyard-floor treatment, prevalence of natural predators of pests

in the past overtreatment with pesticides and fungicides common
over the past 25 years, **various factors** moved farmers/growers away from a ``spray first ask question afterwards'' mentality towards one of trying to understand the cause of problems and non-invasive and non-chemical solutions with chemicals as final resorts as little as possible

- chemicals are expensive to buy/apply
- chemical usage tightly controlled by legal restrictions
- greater public awareness to avoid over-sprayed foodstuff
- increased understanding of sustainability by farmers/growers
- organic and biodynamic movement created awareness of possibility to farm with little chemicals

**IPM: integrated pest management** (lutte raisonee or lutte intégrale in France)

- aim at knowing the cause of the problem, to monitor the situation (weather), to know whether its likely to happen, and take timely preventative measures instead of usu costly curative measures
- uses natural predators when possible eg parasitic wasps whose larvae destroy certain caterpillars or strobilurin-based (dev from toadstool) anti-Oidium sprays
- some problems are proven impossible to control with chemicals thus in time to be defeated by natural predators eg Pierce's Diseases to be controlled with a natural predator ot the leafhopper insects that spread the bacterial disease, also maybe one day a beneficial nematode could destroy phylloxera larvae below ground level thus obviating the need for grafting in some soils
- suitable cover crops planted in the middle of vineyard rows raise the levels of naturally occurring predators in the vineyard and also helps in preventing soil erosion on sloping sites but could also increase the habitat for disease vectors
- IPM in action at UC's IPM website (http://ipm.ucanr.edu/ and grape: http://ipm.ucanr.edu/PMG/selectnewpest.grapes.html)for instance timely monitoring index Grape Powdery Mildew Risk Assessment Index: https://www2.ipm.ucanr.edu/weather/grape-powdery-mildew-risk-assessment-index/?src=redirect2refresh so that growers could decide whether to spray. Natural predator gallery http://ipm.ucanr.edu/natural-enemies/ to fight against pests
- In France the Champagn region is probably the one that has done the most to introduce its growers to the viticulture raisonee and the CIVC issues an annual Guide Pratique for growers to follow

    - the genesis of the drive in Champagne towards more natural practices in vineyards appears the criticism of the once widespread practice of using Paris's composted household waste in their vineyards, leading to unsightly top-dressings of cut-up plastic bags and bottles in the compost (the spread of which now stopped), and the universal use of total herbicides (still widely in use) there
    - some growers are using grass and cover crops [more updated info: Peter Liem]
- IPM difficult to practice to full extent for small growers (esp when contracted and had to follow contractors' spray programs) but economic incentives could be useful (to save money by spraying less)

Harvest intervals:
all chemicals tested before put into market/use with on-label (classed for use on a very wide range of crops and situations) or off-label (for minor crops and certain restricted circumstances) approval, which details

- how the product may be used
- what type of sprayer it can be used in
- how often it may be sprayed and how many times in a growing season
- what amount of product can be used in a season
- how many days must elapse between last treatment and harvest if fungicides and pesticides - **harvest interval** - vary from crop to crop and product to product
    - most products used on wine grapes (cf table grapes or juice grape) have long harvest intervals up to 56 days
    - as there's danger that if traces remain on or in grapes, then yeasts will have problems multiply and fermentations affected
- some products do not have legal harvest intervals eg sulphur but unwise to spray too near to harvest as traces on grapes would lead to production of unwanted hydrogen sulphide in wine

Roses and vines
Roses often planted at ends of vine rows are purely for decoration today as they are crossbred hybridized and clonally selected so that modern varieties no longer get mildew, black spot and other ailments BUT ONCE acted as early warning signs against mildew on vines as the same weather conditions that would give rise to mildew on roses (not transferable to vines) would also cause roses infected with mildew but 10-14 days in advance so growers could spray in advance

DISEASES cause by fungi, bacteria, and bacteria-like organisms
most impactful: Botrytis, Downy Mildew, and Oidium

Botrytis - Pourriture Gris, Grey Mould, Grey Rot, Bunch Rot, Sour Rot, Stem Rot
Common in nature, attacks all vegetable, salad, fruit crops: lettuce turn brown & liquefy, raspberry & strawberry subside into a mass of grey/mauve mound etc.
Likes wet/damp sugary conditions - grapes in climates with summer/autumn rain including table grapes
Physical crop loss, reduces crop quality.
If white grapes are affected, some **extra SO2 in picking bins**, better **pre-fermentation settling** and a **prompt fermentation** with a **high dose of active yeast** could lead to no noticeable Botrytis taint but some fruit aromas/flavors will be lost and color might be darker and more SO2 required in finished wine to achieve a good level of stability.
In red wines more serious problems arise b/c fermentaion with skin/pulp: off-flavor, mouldy taints - charcoal fining to remove.
Botrytis usu present in susceptible vineyards throughout the year: over-winters in the shape of sclerotia present in old wood and on leftover grapes. As soon as spring conditions are suitable, sclerotia provides nucleus for fungus to infect young green tissue in vineyard. In vineyards in regions with summer rainfall and growing susceptible varieties, spraying against Botrytis will start when the first one or two leaves are expanded to about 25mm across and continue at 10-14 day intervals until just before harvest. Some years necessitate 2-3 pre-flowering sprays, then one during and 2-3 after, but still too few. Some dry years with resistant varieties, 2 sprays before and 2 after will suffice.
Early damages will it hard later: it infects flowers and with wet flowering conditions esp when flower caps struggle to detach themselves from the flowers, the disease can remain trapped in the center of the bunch and as grapes expand and bunch closes, Botrytis will be deep inside and no amount of spraying will have any effect: classic bunch rot, substantial crop loss. Thus growers usu make sure as flowering finishes they give their vines a good blast with high-vol air sprayer loaded with effective anti-botrytis chemical: blow out and disperse any fragments of flower caps and stamens left within bunch and coat the remainder with a protective spray.
Botrytis gets resistant to certain chemicals. Late 1960s - 1970s, main products used contained an active

ingredient called benzimidazole (Benlate or Benomyl) for some effective years until a few years later worm populations dwindle, and effectiveness fell away b/c Botrytis strain got resistant.
The next generation anti-Botrytis product is based on dicarboximides - Ronilan, Rovral, Sumisclex were three best known, reliable for a decade until effectiveness tailed off.
In 1995, new product Scala based on pyrimethanil was introduced. Systematic product as opposed to contact-based only product, use restricted to three applications a year. One of the most effective materials against Botrytis and harvest interval only 7 days.
Other best products include Teldor, Switch. Prudent growers normally use a combo of different products throughout the growing season so as to reduce the possibility of resistant strains of Botrytis building up and to-date. Scala maintained its reputation, bearing huge responsibility for growers to producer cleaner corps of riper grapes at higher natural abv levels. Increased hang time is only really possible where your grapes remain healthy until picked. A bio-fungicide called Sentinel developed in NZ using a new strain of a predator fungus Trichoderma harzianum used both in table grapes and wine grapes, said to be as effective as chemicals on the market.
Botrytis also a secondary invader into damaged grapes by machinery, hail, insects, birds, etc. where skins split and pulp exposed. Botrytis will develop and slowly infect the whole bunch, causing stem rot which will result in very large numbers of bunches to fall to the ground. Could be a particular problem in years with large crops where the stems have been weakened by a general strain on the vine's resources.
Alternative to spraying: rows of at least 1.8m wide, open leaf canopy, shoot and leaf removal in the fruiting zone, good air movement beneath the vines will help control the dev and spread of Bo. Spores are transmitted from one part to another by running or dripping water so the quicker leaves/shoots dry out, the less it will spread. An open canopy will also allow chemical sprays to reach their target more easily. In susceptible regions, grape **varieties** that have **smaller leaves** are **less vigorous** and have an **open growth habit with bunches less compact** (looser) and **resistance** to fungal problems will be much less prone to Botrytis and other fungal diseases, will be preferred.

Botrytis - Noble Rot, Pourriture Noble, Edelfaule
Once grapes reach potential alcohol 7%, Botrytis will feed on the berry skin, fungus will puncture the skin of without splitting it, allowing water to leach out, in a slow controlled manner for up to 6 weeks when grapes shrivel, less juice, concentrating sugar content.
Necessary conditions: (1) crops must be clean up til the point where sugar level is at the correct level towards potential abv; (2) humidity required for spores to develop; (3) weather should be warm, even hot. (k) Early morning mists are great (eg Sauternes, Tokay); (kk) suitable varieties: Semillon & Sauv Blanc (Sauternes, Basra, Montbazillac, Australia), Riesling (TBA, BA, Auselese), Furmint & Harslevlu (Tokay), Chenin Blanc, Gewurtz, PG, Riesling (Alsace VT, SGNG), Furmint/Welschriesling/PB/Chard (Ruster Ausbruch)
In some warm regions (California, Australia) where Botrytis is not a natural phenomenon, attempts are made to induce disease by keeping the grapes humid with irrigation and spraying them with a liquid infused with Botrytis spores.
Fermenting Botrytis-affected grapes is slow and seldom deferments partly b/c presence of an antibiotic called botryticine inhibits yeast growth even though tons of RS remain.
Best versions: balance of sugar and acid, rich in glycerol, keeps forever.
Low yields: Chateau d'Yquem ~7 hl/ha; with TBA wines, the harvest may well number just a few hundred half-bottles per hectare, justifiably expensive.

Downy Mildew - Peronospora, Mildiou
1st seen in Europe in 1870s and widespread worldwide.
Impossible ot eradicate, though regular sprays keep it under control.
Likes warm damp conditions, will attack any green part of vine once weather warms up in spring and if allowed to spread unchecked, will destroy flowers and berries, leading to complete crop loss.
Symptoms: grapes turn leathery (German name - lederbeeren - leather berry) and shrivel. If present in sufficient numbers in harvest, infected grapes will impart a moldy taint to the vine. A common pattern to the spread of the disease: chemical control is gained by the grower in the early part of the year but as the leaf wall increases in thickness and density and spray penetration into and air movement within the canopy becomes more difficult, late season outbreaks occur, leading to level severely damaged and photosynthesis reduced thus slowing down ripening process.
Physical control: opening up leaf wall to light air and drying winds - alone will not eradicate and spraying necessary. In 1855 sprays containing copper found effective against Downy Mildew and Bordeaux Mixture (a blend of slaked or hydrated lime and copper sulphate - a potent protective spray against it with characteristic blue/mauve dusty traces seen in vineyard globally, disadvantage: has to be freshly prepared each time, overuse could lead to increased levels of copper in soils, toxic to earthworms and other soil flora/fauna but rainiest, if used past harvest pre winter could help control the disease through dormancy) developed. Other copper

materials - less preparation required, less likely to persist in soil - also used eg copper oxichloride, copper hydroxide.

Oidium - Powdery Mildew
Oidium tuckeri - uncinula necator
native to US, first described in 1834, no damage to native varieties.
1st appeared in Margate on north Kent coast in 1845 (same year as potato plight appeared in Ireland) when Mr Tucker (gardener to Mr John Slater) noticed a white powdery discoloration on a few leaves of a vine in greenhouse, which he sent to a Reverend M J Berkeley who wrote an account of the new disease for the Gardener's chronicle and agricultural gazette and named it after gardener Tucker.
Soon appeared in France - keeper of Versailles grape forcing houses complained of the new disease in 1846 and quickly spread throughout the vineyard regions causing damage. Vintage 1854 was the smallest in France since 1788 caused by a nation-wide attacks of odium. Then growers started treating vines with sulphur - sprayed in cooler regions and dusted with warmer ones - cheap and effective. Sulphur was found to be effective in increasing yields and bringing the harvest forward by 7-10 days, making the uptake of sulphur effective and rapid. Sulphur also works against other diseases and mites. It should not be applied before/during flowering as scorching of flowers may occur leading to crop loss. Application should continue throughout summer if conditions are right for odium.
Odium is worse in dry years than wet years and unlike most fungal diseases, it does not require water to spread from one plant to another - humid air is enough. It prefers warm humid air but dry canopies and thrives inside them. Overwinters on old wood and will start producing spores (spread by wind, will attack any vine part early in season) when conditions are right. Prevention with sulphur impossible and other chemical (expensive) needed for eradication.
Symptoms: white powdery covering on leaves, causing young berries to split open exposing the seeds. Attacks early in the season, so damaged berries never ripen; if a large number of damaged berries were left on vine and machine harvested, it'd taint the juice.
Harvest interval: 21-56 days depending on exact formulation of sulphur but spraying should finish in good time before harvest as if residues get into the wine, H2S with its rotten egg smell will be present in the wine.
Luckily easy to predict - a combo of temperature, humidity, and rainfall readings - and take preventive measures against, aka when spraying would be most effective. Forecasting is necessary as odium is a disease which does not give away until well into its second generation i.e. too late. Organic growers and some conventional growers are using a light mineral oil as an alternative - it destroys the cells of the fungus - has a similar effect on Botrytis, mites, and spiders. Alternative chemicals and preparations are effective for controlling oidium too, e.g., sprays based on strobilurins.

Anthracnose - Bird's Eye Rot, Black Spot
European origin, caused considerable crop loss before Powdery/Downy Mildews. A disease of **damper climates** usu occurs **early in season**. Easily controlled by **Bordeaux Mixture** and other **copper**-containing fungicides. Seldom an isolated problem.

Armillaria Root Rot - Honey Fungus, Oak-Root Fungus
Common problem in woodlands and forests. Can attack roots esp where vineyards have been established on land once wooded.
Symptons: decline in vigor, eventual wilting of the plant. Can be sudden and vines die within a few weeks. Trees on site will usually have shown symptons on their roots. Should be anticipated prior to planting on once-forested land.
Control almost impossible except on localized areas where soil fumigation (usu with methyl bromide) can be undertaken, which is an impractical solution on larger areas. The most practical solution is to fallow the land for as long as possible, deep ploughing the land at regular intervals to expose and the detroy old tree roots. Potential resistant rootstocks to come.

Bacterial Blight
Not widespread but in many parts of the world.
Cause abandonment of vineyards as NO known cure exists. Infected vineyards gradually lose vigor, yields fall and become uneconomic.
Only method of control: remove infected vines and pruners must disinfect secateurs in-between vines. **Copper sprays** help with its control and it is worse in **regions with summer rainfall** than in drier areas.

Black Rot (Le Black-Rot in French)
Caused by an organism Guignardia bidwellii, impossible to eradicate once present. Native to North America and was introduced into French vineyards in the 1880s. Unlike Phylloxera did not enter via Great Britain.

Control aided by keeping a clean vineyard, destroying affected material esp unpicked or fallen grapes, having an open airy canopy. Chemical control will be necessary in most vineyards.
It starts early in the season as soon as temperature/moisture conditions are right, thus sprays need to continue through and until well after flowering. Controlled by the same spectrum of chemicals used to control other major fungal diseases esp Downy Mildew so practically does not require singular treatment.

Crown Gall - Black Knot
Cause by bacterium called Agrobaterium tumefaciens, has been known in European vineyards since mid-1850s. Known as Krebs (Cancer) or Mauke in German.
Most common method of distribution is through grafting thus possible for complete batches of vines to be infected. The most common time of infection is following damage to an established vine after severe winter frosts has split the trunk or after mechanical damage to the vine from how/weeder/mower. The bacterium oft present in soil takes up residence and causes a large woody gall which swells to the size of a golf-ball or larger, and in doing so destroys the graft and the vine dies.
*Ploughing close to the vine such that earth is piled up around and over the graft prior to the winter* (**buttage**) can help prevent winter injury to the graft. In New York state, growers will **train multiple trunks up from the base** such that if one becomes infected, it can be cut off and the vine remains productive.

Esca - Black Measles, Apoplexie
More common in warm/hot regions, caused by one of several different fungal pathogens.
Initial damage usu shows up on the leaves with light colored areas between the veins eventually leading to leaf-edges that become necrotic (turn brown). On the grapes, dark speckling, aka black measles, will initially occur, leading to shrivelling and dropping. In severe situations, the vine will suddenly wilt and die.
Control is helped by keeping the vineyard clear of old wood, disinfceting large pruning wounds and avoid pruning systems with large amounts of permanent wood (long cordons, GDC, Sylvoz etc)

Eutypa - Eutypa Dieback, Eutypiose
Widespread around the world esp in regions of **over 600mm annual rainfall**. No respecter of variety or site.
Caused by fungus - Eutypa lata - often introduced via grafting.
Rarely shows in young vines, but waits until vines reach ~10 years old, when their vigor starts to weaken.
First sign: spring shoots fail to thrive and remain short and stunted with very short internodes and malformed, chlorotic (yellowing) leaves. Damage often confined to only one arm of a spur-pruned vine, aka why confusingly known as dead arm, a term more commonly used for phomopsis. One way to confirm: cut through the arm or trunk of a vine: wedge-shaped portion of the arm or trunk that is dead often extending to 1/3 of overall area of the arm/trunk if infected. As vine becomes more infected, this area will increase until the vine dies.
No immediate/effective long-term cure for Eutypa. When present, **large pruning wounds can be washed with a suitable fungicide** (**Benomyl** often quite effective) and **secateurs** have been adapted that will **deliver a spray of this chemical** as and when each cut is made, slowing down pruning process. **Painting each cut with fungicide** paint is time-consuming/expensive too. Both could slow down the rate of advance of the disease. **Pruning later** in the season will also help as pruning wounds heal faster the warmer (within reason) and the natural bleeding of vine in Spring will also afford some protection as this seals the cut surface of the vine. **Avoid training systems with sustaintial amounts of old wood** eg **spur-pruned cordons**, **in favor of cane-pruned systems** could help as Eutypa prefers bodies of old wood. Some success in rejuvenating infected vines achieved by taking new shoots emerging from near the ground above the graft and completely retraining the trunk, which results in ~2 years' lost crop while the vine produces new fruiting wood, but does give the vine another few years of productive life. Removing old wood from the vineyards after pruning and burning will stop the spread but not always successful as it is also found in a number of non-Vitis species.

Grapevine Yellows - Flavescence Doree
A general terms for a group of related diseases caused by phyto-plasma (microscopically small organisms similar to bacteria which gain access to the sap of the vine. First discovered in the 1940s in the Armagnac region, FD has now spread throughout Europe by way of vectors eg sap-feeding insects that travel from one vine to another and by using infected material in the vine-grafting processes. Present in many vineyard regions.
Infected vines have curling leaves that turn yellow and ripening/yields soon affected.
No known chemical control, control confined to keeping vectors under control and reducing the plants (weeds, grasses) that they live in and on, better hygiene in the vine nurseries. New vines can be treated by immersing in hot water at 50C for 30 min before planting, which will reduce the incidence of grapevine yellows and other ailments like nepoviruses.
First seen in Australia in mid-1970s, present in several regions and led to severe crop loss.

Phomopsis - Phomopsis Cane and Leaf Spot, Dead-Arm, Excoriose
Phomopsis viticola, widespread, esp prevalent in regions with **regular summer rainfall**. Cntrolled by chemicals used against Downy Mildew (as with Black Rot) and no separate treatment needed. Can be a problem in nurseries thus newly planted vineyards may require spraying. Certain varieties very susceptible.

Pierce's Disease - PD, Anaheim Disease
First seen in Anaheim in SoCal 1892, has spread to North/South/Central America since, rare in other parts of the world even though not unknown.
A fungal disease caused by a bacterium Xylella fastidiosa that lives in the xylem of the plant (water-carrying tissue in vine wood), spread by various insects eg leaf-hoppers (blue-green sharpshooter, and the glassy-winged sharpshooter). Thus control of PD relies on control of insect vectors.
First symptons usually seen at the end of the first summer of infection: unusual staining and marking of the leaves. In the second year of infection, the vine is less vigorous, with stunted shoots which ripen badly, leading to substantial crop loss. Young vines more susceptible than old vines, infection could lead to an unviable vineyard.
No known chemical measures. Control centers upon limiting the numbers of sharpshooters in the vineyard and vicinity. When first appeared in north Cal, it was largely due to blue-green sharpshooters that prefer spending summers in water courses so keeping vines free of weeds and at some distance from water courses was helpful. The glass-winged sharpshooter is a more wide-ranging insect, not confined to river banks thus more difficult to control. Varieties vary in susceptibility but Pinot Noir and Chardonnay are easily damaged thus PD extremely damaging for California. Rare in Europe and in regions with cold winters, its spread is much slower. BUT with global warming, sharpshooters might over-winter and aid the spread of PD in Europe.

**VIRUSES**
Main conduit for the spread of viruses: nurseries taking plant material for both scions and rootstocks from virus infected vineyards.
Often spread by more natural methods and vectors eg nematodes and insects will transfer them from one plant to another
Mandatory ELISA testing of source material and a relatively effective plant passport system ensures a good degree of traceability, the spread of viruses has been greatly slowed.
But in regions where nursery hygienes are lacking, no official controls and growers are free to plant ungrafted rooted cuttings, viruses are an ever-present hazard.
Several viruses are only of concern to nurseries as they make grafts fail or cause vines to die being rooted prior to sale.
For grape growers, only the following five are the most important:

Corky Bark
One of the most widespread viruses.
Red or red/yellow leaves curling downwards and refusing to drop when the vine enters dormancy or even for a short period after frost. Canes become grooved and areas on the main stems expand and turn corky.
Effect not universal on all species and all varieties and some esp hybrids and native North American vines may well be much more damaged than viniferas. As with most viruses, there is no cure and removal and destruction of infected vines the only real solution.

Fanleaf Degeneration - Fanleaf Virus, Court-noue
One of the oldest, present in European vineyards for over 200 years.
Leaves distort and grow in the shape of a fan and may change color to a mottled green. Growing tips may split into two or even three different shoots with flat distorted nodes and canes. More severely, leaves become yellow in patches or with yellow veins (aka yellow mosaic and vein-banding). Yields fall and stop altogether.
The only cure is to remove and destruct infected material, fallowing the site for as long as possible — even though the virus could remain in old roots for up to six years — and replanting with virus-free plants.
Nematodes are vectors of Fanleaf Virus and thus planting on nematode resistant rootstocks aid control of fanleaf virus.

Leafroll
Probably causes the most economic damage of all viruses.
Caused by more than one viruses with similar symptons, so generally referred as one virus.
Hard to control as symptons do not appear on all diseases vines esp American rootstock varieties thus extra caution for the nursery.
A rolling of the leaves, with slight veining, coupled with a color change, esp in the autumn from green to

bronze then ro red. Many photographs of vineyards showing glorious autumn colors are in fact heavily infected by leafroll virus!!
Reduced yields, grapes take longer to ripen, fail to achieve the required sugar level.
Spread in the grafting process, also vectors eg Mealy Bug helped its spread in NZ and South Africa (widespread b/c distribution of infected material during the apartheir years when plant material form overseas was unavailable and vines produced by very few not very independent careless nurseries), albeit rare. Now infected vineyards are being taken out and replanted with virus-free plants.

Nepoviruses
are a group of 113 viruses (all share similar polyhedral structure) spread by nematodes, closely related to fanleaf degeneration, including tomato ringspot, tobacco ringspot, Arabis mosaic (nepo)virus.
Difficult to control once in vineyard, can live in infected plant material for ~10 years.
Treatments in the nursery: heat-treatment of cuttings, hot water dipping of grafted vines can also reduce the incidence of these viruses.

Rugose Wood - Rugose Wood Complex, aka Legno in Italy
RW - a catch-all term to describe vines affected by several different viruses including Rupestris stem-splitting, Kober stem-grooving, Corky bark and LN33 stem-grooving.
More of a concern to nurseries: losses in vine nurseries b/c poor grafts and deaths of immature vines are in nursery