URGENT PRESS RELEASE

Standing Water throughout the Central Valley.

UC Cooperative Extension Advisors are local representatives of the University of California that produce and extend relevant science-based information to the public. They maintain relationships with community leaders and collaborate with personnel in other agencies in alignment with their mission as an agent of positive change and public service. They serve as resources for public and private organizations.

On March 20th, 2023, Kings County elevated the Emergency Operations Center (EOC) to a level II in response to the local flooding regarding the persistent storms and snow melting have forced Success dam's spillway into a swollen Tule River. Several cities, communities, rivers, and agricultural lands are under flood alert. Here are some of the local programs it is affecting in our areas.

Pumping excess water out of fields.

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This winter has brought exceptionally cold and wet conditions and subsequent flooding from high precipitation and overflow of streams. Due to several extended freezing conditions, many small grain growers have experienced visible frost damage to their crops, but the economic impact is not yet known. Prolonged cold, wet soil conditions have caused an increase in observation of small grain crop damage from commonly used herbicides which are safe for these crops under normal weather conditions. Some fields may have economic loss due to reduced yield if the plants did not recover fully from these injuries. Many safflowers, blackeye pea and cotton growers have been delayed in their planting since the soil has been too wet to drive equipment on the field without severely damaging soil quality. Flooding from extreme precipitation has caused some fields to be under water for several days to weeks at a time. Flooding in some areas from stream overflow is expected to persist through summer. These latter flood events cause an immediate hazard to people living and working in the area and are expected to have lasting negative economic impacts on the area due to damage of property and loss of revenue from crop production.

Vegetable Crop Program
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Fresno County large scale vegetable production impacts due to wet weather.

Fresno County large scale vegetable production impacts due to wet weather.

In Western Fresno County, from Nov 2022 through Mar 2023, 10.5 inches of rainfall were recorded, which is approximately 56% higher than the historic average. The wet conditions in this area resulted in a higher incidence of foliar diseases of some vegetable crops, a different mixture of weeds/naturally occurring vegetation in the foothills and on the valley floor, and there were delays in planting of spring/summer crops. In addition, Westland's Water District water user allocation is currently 80% of the water entitled to under contract. This follows zero allocations during the previous two years. The weather has presented both challenges and opportunities in this production area.

In vegetable crops, wet cool conditions increase the chances of diseases caused by fungi and bacteria. Due to the wet weather, diseases of the foliage of lettuce, cilantro and parsley that occur infrequently in this production area were present this season. If wet conditions continue, issues with rust in garlic and downy mildew in onions could be expected. Should wet conditions persist into May, foliar issues on tomatoes could become a challenge as well.

Unusually wet conditions caused a change in the vegetation in the area. Naturally occurring vegetation in the foothills west of the production area is currently dominated by grasses, which is not favorable for beet leafhopper that transmits beet curly top virus. This virus occasionally causing serious losses in tomato crops. In addition, survey results from the California Department of Food and Agriculture, Beet Curly Top Virus Control Program (CDFA, BCTCP) have detected

very low numbers of leafhoppers this season. However, the dynamic of weeds on the valley floor is different due to recent cropping alterations regionally and although there is no early indication of a hazard, later season conditions will need to be monitored. The mixture of weeds in some fallow fields can harbor other insect pests and management of weeds near production areas will reduce risk. If weeds are being disked or treated with herbicide after tomatoes are planted, consider treatment of that non-cropped area to reduce the risk that insects capable of damaging tomato crops may move after their habitats are disrupted. The CDFA, BCTVCP can be contacted to assess potential risk due to leafhopper in weedy areas.

The wet field conditions delayed processing tomato planting. Many fields scheduled for earlier plant dates are being planted now. The delay in planting may result in a maturity of many fields occurring within a short period of time that can cause harvest delays. If this occurs, dependent upon the environmental conditions, there may be increased risk of black mold fruit rots.

The increased irrigation water availability for this season is very favorable for production within Westland's Water District and a larger than average production year for tomatoes is expected, but there are some risks presented due to the conditions that we have experienced.

Orchard Impacts due to Rain and Flooding
By: Elizabeth J. Fichtner & Mae Culumber

SSJV Orchard Systems Impacted by Rain.

Farm Advisor

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The unusually wet winter and spring of 2023 has had unprecedented impacts on our local orchard systems. However, the cumulative impacts of a barrage of atmospheric rivers and persistent standing water in some flooded areas may not be realized for another year. Cold and rainy conditions during bloom limited pollinator activity and impeded orchard access for spray operations, creating the ideal conditions for the onset of plant pests and disease issues. The

timing of bud and shoot development has likely also been impacted, as the buds for next year's crop are formed during the current year; therefore, the unusually wet and cold spring of 2023 may also influence the development of the 2024 crop.

The bloom period for many *Prunus* species (almond, peach, cherry, plum, prune, etc.) was unusually protracted due to the high frequency of rain and cool temperatures. Saturated soil conditions limited orchard access, resulting in delayed shaking of mummy nuts in almond, an essential sanitation practice for management of navel orange worm, a key insect pest. With few bee flying hours available for pollination, and wet, cold conditions conducive to disease development, the crop outlook for 2023 remains uncertain.

Pistachio, walnut, and pecan, all wind-pollinated crops, are experiencing delayed bud break and shoot development. The progression of bud break appears to be at least 10 days behind the norm and the timing and synchrony of male and female flower maturity is yet unknown.

Orchards that have sustained flooding may be physiologically impacted by roots persistence in anoxic conditions and may also be exposed to waterborne plant pathogens. Over time, saturated soil will become depleted of oxygen by the roots and microbial communities resulting in anoxic conditions that can lead to root mortality. The extent of damage to the roots may not be realized until the season progresses, and root damage may manifest with general canopy decline and anchorage issues. Many of the tree crops grown in California are grafted onto disease resistant rootstocks. If flood water rises above the graft union, the benefit of these rootstocks is largely negated. Many rootstocks have been selected over time for resistance to *Phytophthora* spp., a group of soilborne pathogens that create motile spores that swim at the water surface. These pathogens are common in surface water, and incite canker diseases, particularly when the water level persists above the graft union. Symptoms of infection include general canopy decline and cankers, many of which ooze or 'bleed'. The full suite of symptoms may not manifest until further into the growing season when the heat imposes stress on the trees.

The rainfall and flooding have additionally influenced the nutritional status of orchard soils. Cool, wet soil conditions slow the chemical and biological reactions that control the availability of nutrients for tree uptake. Micronutrients, present in only trace concentrations in soil, become particularly limited as the wet and cold create reductive conditions that promote lime-induced iron chlorosis, a common nutritional deficiency in prunes, almonds, and citrus. In sites that have undergone whole orchard recycling with incorporation of woody biomass into the soil, saturated, anaerobic conditions may moderate the microbial activity needed to stimulate wood chip decomposition and further restrict nutrient availability until the soil warms. As rivers breach their banks, rushing floodwater may transport the less-soluble nutrients, such as sulphate of potash (SOP) that is often applied in the autumn, away from the tree rootzone. As water moves through the soil profile, other nutrients, such as nitrogen, may be lost from the rootzone by leaching. The leaching will, however, ameliorate salt accumulation after years of drought, particularly in sites that have relied on saline groundwater for irrigation.

As the season progresses, growers should work closely with their PCAs, crop consultants, and UCCE farm advisors to observe and document orchard changes in the 2023 season. Photographs should be taken of anomalies, such as delayed bud break, so comparisons may be made to past

and future years. Additionally, photos of putative disease and insect issues may easily be shared with representatives from private industry as well as researchers in the UC system for both diagnosis for both diagnosis and discussion of best management strategies.

A suite of photos and management options for the most common pest and diseases of agricultural crops can be found at the UC IPM website www.ipm.ucdavis.edu

Effects of Vineyard Flooding
By: Karl Lund

Vineyard flooded from the rain

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The 2022 - 2023 rain season has already been prolific. The California Department of Water Resources has a series of precipitation stations across the Sierra Nevada Mountains to track yearly rainfall. The data is broken up into basins, with the San Joaquin Basin and Tulare Basin being relevant to the greater San Joaquin Valley. The San Joaquin Basin runs from Calaveras Big Trees in the north to Huntington Lake in the south and serves as the headwaters for the San Joaquin River. The Tulare Basin runs from Balch Park in the north to Isabella Dam in the south and historically this water would have fed into Tulare Lake. As I am writing this on April 5, 2023, the San Joaquin Basin has recorded 61.2 inches of rain, well above the 1991-2020 average of 39.9 inches and approaching the 1982-1983 record of 77.4 inches.

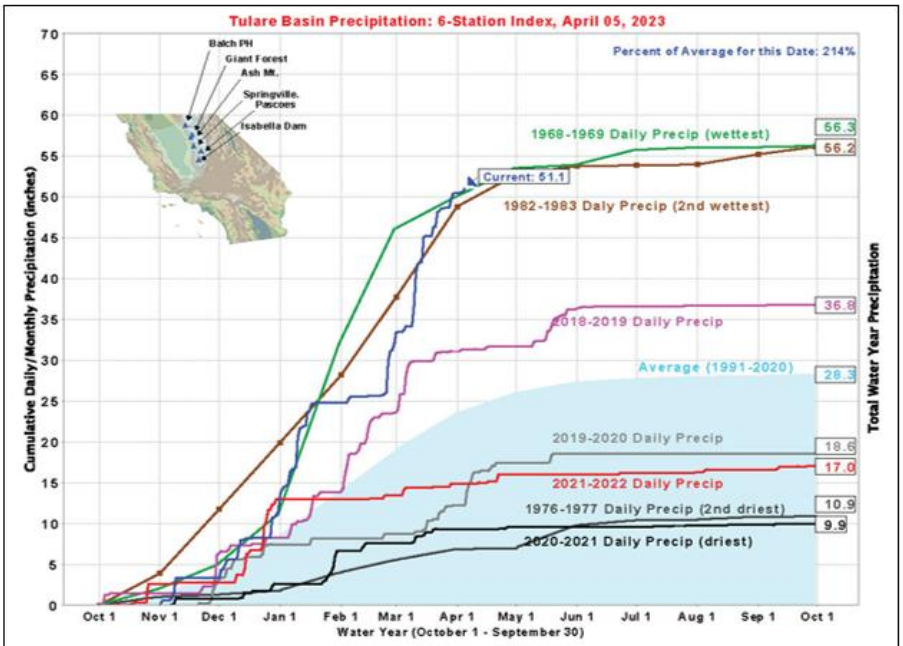

Image 2 Tulare Basin Precipitation for Oct 1, 2022 - April 5, 2023 (dark blue) compared to average (1991-2020) rainfall (light blue), and various other years. Downloaded from: https://cdec.water.ca.gov/snow_rain.html

The Tulare Basin is at 51.1 inches, well above the 1991-2020 average of 28.3 inches and getting close to the 1968-1969 record of 56.3 inches.

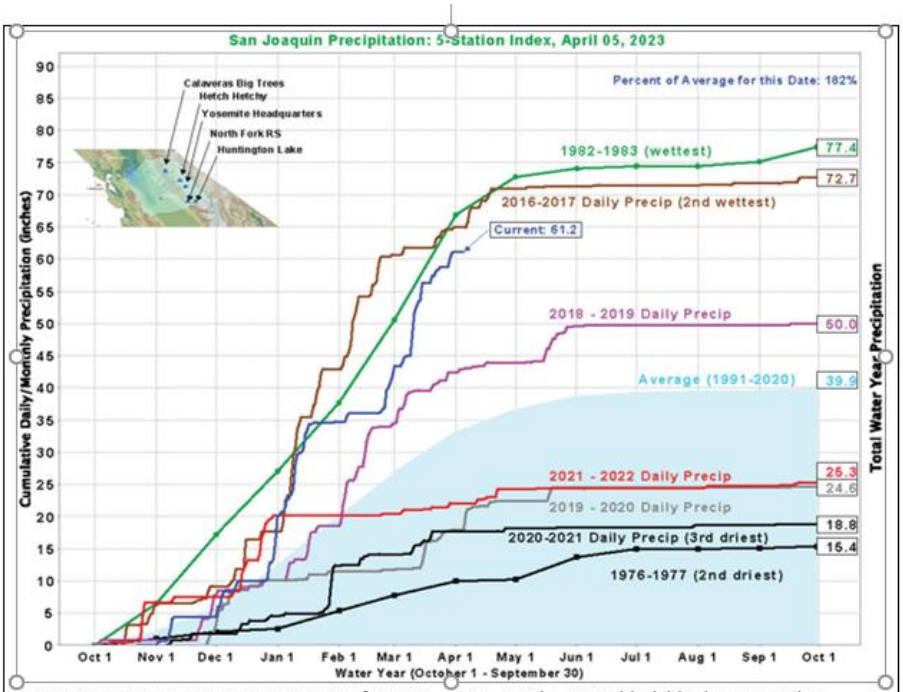

Image 1 San Joaquin Basin Precipitation for Oct 1, 2022 - April 5, 2023 (dark blue) compared to average (1991-2020) rainfall (light blue), and various other years. Downloaded from: https://cdec.water.ca.gov/snow_rain.html

This excessive rain has led to waterlogged vineyards and flooding across the San Joaquin Valley.

The effect this water will have on your vineyard will heavily depend on how much water is in your soil profile and how long into the growing season the water remains. The amount of water in your vineyard soil can range from waterlogged to saturated to field capacity to below field capacity. Field capacity is the state where all the micropores in your soil profile are filled with water, while the macropores are filled with air (including oxygen, which will be important later). As you drop below field capacity the micropores are drained of water until you hit the permanent wilting point. At the permanent wilting point your vines can no longer remove water from the soil, and you need to irrigate your vineyard. Of course, the extra rain this dormant season has sent most vineyards in the San Joaquin Valley in the opposite direction. Saturated soils are soils where both the micro and macropores are filled with water, removing air from the soil profile. Lastly bringing us to waterlogged soils where the soil profile can no longer hold any more water and ponding begins in your vineyard. The amount of water needed to move between each one of these levels of soil moisture will vary dependent on the type of soil and the soil matrix.

During the dormant season, grapevines are very tolerant of saturated and even waterlogged soil. Flooding a vineyard 40 cm (15.7 inches) deep with water for 40 days was an early (and effective) method of controlling phylloxera outbreaks. Problems with excess rain and flooding during the dormant season come down to soil movement and compaction, as well as vineyard access. Soil erosion during heavy rains can remove, move, or deposit soil in your vineyard. This can lead to vines or vineyard infrastructure being uprooted or buried during these events. Saturated soils can also lead to soil compaction and hardpans. As heavy equipment passes over saturated soils it creates compacted soil layers leading to hardpans within the soil profile. The compacted soils and hardpans make it harder for the vine's roots to easily spread throughout the soil profile, limiting the growth of your vine's roots. Compacted soils and hardpans also make it hard for water to penetrate deep into the soil profile. This can make your irrigation less effective at wetting deep soil layers and leave your vineyard open to worse runoff and erosion when the next

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Reference Resources:

California Department of Water Resources, California Data Exchange Center Webpage: https://cdec.water.ca.gov/index.html

Williams LE, Dokoozian NK, Wample R. 1994. Grape. *In* Handbook of Environmental Physiology of Fruit Crops. Schaffer B and Peter C (eds.), pp 115-116. CRC Press, Boca Raton, Florida, USA

Wine Grape Varieties in California UC ANR Publication 3419 pp 12-15

heavy rainfall year happens. This will all limit your ability to access your vineyard and conduct normal dormant season vineyard operations.

Once the growing season commences, the hardiness of grapevines to saturated and waterlogged soil drops considerably. The issue during the growing season is not with the saturated soil itself, but with soils where the oxygen in the soil profile is severely limited. For root growth to occur the roots need to metabolize sugar either directly from the canopy or from storage in the permanent wood structures (trunk and cordons). Just like us humans, grapevine roots need oxygen to metabolize that sugar. If the soil profile is so saturated that oxygen is limited, root growth will be reduced or stopped. As young feeder roots are the primary uptake point for nutrients from the soil, this will have several detrimental effects on the grapevine including reduced shoot growth, leaf chlorosis, and eventually vine death (Williams et al. 1994). The level of resistance your grapevines will have to saturated and waterlogged soils will be determined by the rootstock the vineyard is planted on. For rootstocks "wet feet tolerance" is used to describe the ability to withstand overly saturated soils.

The two most common rootstocks used in the San Joaquin Valley have vastly different abilities to tolerate wet feet. 1103P is one of the top-performing rootstocks with a moderately high tolerance to wet feet, while Freedom is near the bottom of the list with a low tolerance to wet feet.

For vineyards, whose soil is at field capacity, the excess precipitation seen during the 2022-2023 dormant season will still affect how the 2023 growing season will go. Many of these topics were covered in the most recent edition of Vit Tips. As the storm window is still open, a cold front could bring freezing conditions to the San Joaquin Valley. Methods to prevent frost damage were covered by Dr. Justin Tanner's article Passive Measures to Reduce Impacts of Late Spring Frosts. The excess moisture in the soil will lead to heavy weed pressure this year. Dr. Karl Lund covered this topic in his article Vineyard Weed Control After a Wet Winter.

If you need technical assistance or a confirmation letter, please contact the Tulare County Resource Management Agency at (559) 624-7000.

For agendas and minutes of Tulare County Flood Commission meetings **click here**.

Cottonwood Creek Storm Water Resource Plan

Flood Control Master Plan (Adopted 1972)

Community Flood Maps

Storm Preparedness Handouts

Sandbag Distribution Locations

Tulare County Flood Control District Projects

Flood Control Insurance

Department of Water Resources Best Available Maps

FEMA Flood Maps

Rootstock	Wet Feet Tolerance
1616C	High
SO4	Moderately High
1103P	Moderately High
Schwarzmann	Moderate
101-14	Moderate
110R	Moderately Low
5C	Moderately Low
3309C	Moderately Low
St. George	Moderately Low
Dogridge	Moderately Low
420A	Moderately Low
Ramsey (Salt Creek)	Moderately Low
140Ru	Low
Riparia Gloire	Low
Harmony	Low
Freedom	Low
5BB	Low
99R	Low

Table 1 Wet Feet Tolerance of various rootstocks. Table adapted from Wine Grape Varieties in California

George Zhuang covered several other general topics in his article After a Wet Winter: What You Should Do and Shouldn't Do.

California Disaster Assistance Programs
By: Noelia Silva del Rio and Daniela Bruno

Tule River Flooding

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When the last atmospheric river of this winter made landfall in California, the Kaweah and Success Dams were at an unprecedented record-high capacity. With the fear of Success Dam overflowing, the US Army Corps of Engineers prepared for a quick water release. The situation was so urgent that there was no time to fix levees, clean up riverbeds of debris, raise flood barriers, or prepare evacuation plans. Along the Tule River spills were unavoidable and frequent. One month later, some producers are still in response mode, watching how the snowmelt feeds the Tule Lake.

To navigate the aftermath of the flood, several federal assistance programs are being offered. Sorting through all the information can be difficult. Here is a summary of some of the resources available:

The USDA and CDFA offices are informing stakeholders through a webinar that you can find here California Disaster Assistance Webinar | Farmers.gov . In this webinar, the Rural development Agency [RD; min 5 to 13], the Farm Service Agency [FSA; min 15 to 26], and the Natural Resources Conservation Service [NRCS; min 27 to 37] inform stakeholders on assistance programs available. This webinar was broadcasted live on April 11th; there is a follow-up with question-and-answers scheduled for Thursday, April 20th at 8 a.m. PT. Click here to join.

If you are interested in in-person seminars, you can attend the Disaster Assistance Workshops for Farmers and Dairy Producers. In Tulare County they are scheduled for April 19th and 25th Workshops Tulare . If you still have questions, reach out your local USDA and NRCS office for more information [Visalia: (559) 651-3015; Hanford: (559) 584-9209].

This month, Tulare and Kings Counties have been added to the major disaster category for Public Assistance funding through the FEMA California Disaster Declaration: https://www.fema.gov/disaster/4699/designated-areas#how-distater

For those interested on disaster response resources for California business please check this link: https://calosba.ca.gov/wp-content/uploads/Disaster-Response-Resources-for-California-Business.pdf.

Also make sure you have completed these **county surveys**:
1. To quantify losses to activate state/federal aide.
    - Fresno County: Property Damage Form - Fresno County (arcgis.com)
    - Kings County: Property Damage Form (office.com)
    - Tulare County: Property Damage – Tulare
2. To help AG Commissioner's prepare the damages report:
    - Fresno County: AG Commissioners Survey Fresno
    - Kings County: Agstaff@co.kings.ca.us or (559) 852-2830
    - Tulare County: AG Commissioners Survey Tulare

Check if your county offers Property Tax Relief (Tulare County tax relief).

Kearney Agriculture Research and Extension Center

Ducks Floating in Fields and Orchards from Recent Rains.

Staff Research Associate

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Effects at Kearney:

Mixture of cold weather and rain has delayed many projects. Specifically, our projects focus on irrigation and there has not been a need for it yet. Regrowth on crops such as alfalfa has been very slow, and we are unsure when the first cutting will be; it is usually at the start of April. Some fields have issues with standing water (picture); the crew has been working to pump it into other fields or areas where it is less likely to damage crops. Rain and wind have caused minor damage to buildings on station, but nothing major.

Effects on off-site research:

Standing water has plagued our research for most of the year. Either fields are too wet to get into to install sensors/take measurements or roads to get to them are flooded/closed. Several of our sites are just north of flooded areas in Kings and Tulare counties. There are particular issues at dairy sites south of Hanford; many of these have lost fields due to standing water from rain runoff.

Resources

Army Corps of Engineers manages most of the reservoirs, in particular interest to us are the ones on rivers that feed Tulare Lake: SPK WCDS - Hourly Time Series Reports (army.mil) .

We at Kearney are keeping an eye on the outflow of Pine Flat on the Kings River, as it passes within 2 miles of the station. I worry the amount of snow (Snowpack Conditions - Snow Water Content Chart (ca.gov)) will lead to more flooding later this spring and summer.