

Field Notes

San Joaquin County
August 2018

University of California
Agriculture and Natural Resources

PRACTICAL • CONNECTED • TRUSTED

Welcome Our New Advisor

My name is Anthony Fulford, and I am a newly appointed Nutrient Management and Soil Quality Advisor. My office is located in the Stanislaus County Agricultural Center in Modesto; however, I will also be covering San Joaquin and Merced counties. Currently, I am developing the direction of my research and extension program and welcome your feedback on knowledge gaps and research priorities for nutrient management and soil quality. I will be attempting to meet with many of you in the coming months, but until then, I wanted to tell you who I am, where I have been, and how I came to California.

I grew up in Illinois with a desire to understand the interconnectedness of natural ecosystems. My passion led me west to Colorado where I studied forestry at Colorado State University. My experience in Colorado convinced me to enroll in graduate school where I studied soil remediation and reclamation of urban soils in Illinois and soil fertility of rice cropping systems in Arkansas. It was during graduate school that I realized I wanted to understand how effective nutrient management could sustain and improve ecosystem services. I continued on with postgraduate research where I focused on soil health testing and nutrient management practices for corn, soybeans, and wheat in Ohio.

My general interest in soil health and nutrient management continues to expand, but my previous research has focused on the development of rapid and cost-effective nitrogen soil test methods. One of the questions I wanted to address during my graduate research in Arkansas was whether we can identify a soil nitrogen test capable of accurately predicting the yield-maximizing nitrogen rate for rice at the beginning of the growing season. This project led us to discover that by quantifying nitrogen from a 0 to 12 inch sampling depth, we could improve our prediction of mineralizable nitrogen and ultimately the accuracy of our recommended fertilizer nitrogen rate. The question I wanted to ask during my postgraduate work in Ohio was whether we can balance phosphorus and potassium fertilization with nutrient removal in corn and soybean grain to effectively maintain long-term (9 year) soil test levels of those nutrients. The main result of this project was that we were unable to maintain initial soil test phosphorus and potassium levels using the estimated removal rates. In fact, our results highlighted an inability to adequately manage phosphorus and potassium fertilizer according to the "build-and-maintain" philosophy of nutrient management. These unexpected results are leading us to rethink our long-term nutrient management objectives, and these changes will likely be reflected in revised fertilizer recommendations for Ohio.



I am excited by the opportunity to work here in California to advance soil health and nutrient management. There is a good deal of interest in establishing practices at the farm level that will improve soil health while simultaneously maintaining productivity and profitability. I would like to build on this interest and bring practical information about soil health testing and nutrient management to San Joaquin County. I hope you will join me in addressing some of the emerging questions surrounding nutrient management and soil health in California. I can be reached at (209) 525-6825 or amfulford@ucanr.edu.

Anthony Fulford, Nutrient Management and Soil Quality Advisor, Stanislaus, San Joaquin, and Merced counties

Can you identify Nutria?

We are helping to spread the word about Nutria – an A-rated pest that has the potential to destroy wetlands and weaken water infrastructure. Nutria are rodents that resemble muskrats and beavers. Please see the attached CA Department of Fish and Wildlife flyer on page 2 to learn more about nutria and what to do if you observe them.

Table of Contents:

Welcome Our New Advisor.....	1
Nutria: The Triple Threat to California's Future	2
Understanding the Overwintering Biology of the Husk Fly.....	3
Cover Cropping Trial in the Delta.....	4
Calendar of Events.....	5
Warm Season Cover Crops Field Day	6
California Sorghum Silage: Nutrient Composition and Fermentation Characteristics	7
Pest Management Update for Tomatoes	8
Livestock and Natural Resources Update	9
Walnut Short Course	10



NUTRIA:

The Triple Threat to California's Future

**A-RATED AGRICULTURAL PEST • DESTROYS WETLANDS
WEAKENS WATER INFRASTRUCTURE**



HOW LANDOWNERS CAN HELP

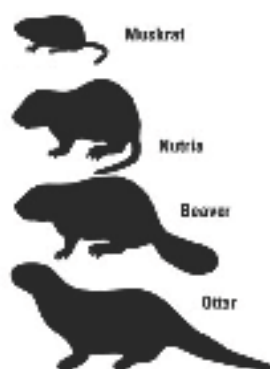
Private landowners can join the fight to protect California's agricultural economy, water resources and precious wetlands. In fact, landowner cooperation is critical to the success of CDFW's nutria eradication efforts. Landowners can obtain free assistance protecting their property from this destructive rodent by granting CDFW permission to access their property. For more information, call (866) 440-9530 or e-mail invasives@wildlife.ca.gov.

A CASE OF MISTAKEN IDENTITY

Often confused with beaver and muskrat, nutria have the following distinguishing characteristics:

- White whiskers
- Round, rat-like tail
- Dark black ears with lighter-colored fur below
- Large blocky head, often with orange teeth
- Body length up to 24 inches
- Weighs up to 22 pounds
- Partially webbed hind feet

Different bodies



Different tails

MUSKRAT TAIL



BEAVER TAIL



NUTRIA TAIL



Report nutria sightings, request free CDFW assistance at (866) 440-9530 or invasives@wildlife.ca.gov. Visit wildlife.ca.gov/nutria for more information.

Understanding the Overwintering Biology of the Husk Fly—A Research Update

Background on walnut husk fly. Walnut husk fly has been an increasing problem in walnut growing areas. Female flies lay eggs underneath the walnut husk, and the larvae (“maggots”) feed in groups into the husk. Early season damage results in shriveling and darkening of the kernels, with the increased potential for mold growth. Late season infestation causes little kernel damage; although, it may stain the shell, making the husk removal process difficult. Walnut orchards or trees near to rivers or in proximity to black walnut trees are known to be at risk. Although the husk fly can attack all major varieties of walnuts, the most susceptible varieties are Eureka, Payne, Hartley, Serr, and Tulare. The husk fly overwinters as a pupa in soil and emerges as an adult during the summer, from June through September in the Central Valley. The flies are attracted to yellow sticky traps, supercharged with ammonium carbonate, as they search for the nitrogen-based food which is critical for the development of their eggs and egg laying. Mature larvae, after feeding on the husk for a few weeks, drop into the ground, settle and pupate there. Current husk fly control is primarily dependent on multiple sprays of insecticide to cover the entire fly emergence period, and that begins as soon as a single fly is captured in the trap. We have limited understanding of overwintering biology of the walnut husk fly in the soil, and therefore, in this study, we explored one of the basic questions related to the overwintering biology of this fly: What is the depth of husk fly pupation in the soil? This information may help in exploring alternative strategies for husk fly control.

Procedure. We developed a technique (dry & wet sieving technique) to recover pupae from the soil. The study was conducted in two orchards in San Joaquin County in December. In each orchard, four soil samples were collected from each of the four adjacent trees in a square pattern. Samples were taken from 10 x 12-inch areas at three depths (<2 inches, 2-4 inches, 4-6 inches). The samples were then sub-sampled to fill an aluminum pan and pro-

cessed to recover the husk fly pupae. For soil processing, we developed a dry and wet-sieving method. In this method, we assembled two separate wooden frames (Fig. 1A) with two screen sizes (big: 5 x 5 mm, small: 2 x 2 mm). The soil was first dry-sieved using the big screen (Fig. 1A), followed by wet sieving using the small screen (Fig. 1B), leaving the husk fly pupae on the screen (Fig. 1B,C).

Results. In Orchard 1, a total of 48 pupae were recovered from 16 subsamples. Of the total number, 53.5%, 28.6%, 17.9% were from the top 2, 2-4, and 4-6 inches of the soil, respectively. The average number of pupae per subsample was 0.94, 0.50, and 0.31 for soil depths <2, 2-4, and 4-6 inches, respectively (Fig. 2A). In Orchard 2, the average number of pupae per subsample was 0.94, 0.19, and 0.13 for soil depths <2, 2-4, and 4-6 inches, respectively (Fig. 2B). The percent pupal distribution was 75%, 15%, and 10% for soil depths <2, 2-4, and 4-6 inches, respectively. When we combined the data from the two orchards, the overall distribution of pupae was 63%, 23%, and 15% for soil depths <2, 2-4, and 4-6 inches, respectively (Fig. 2C).

Conclusions. Using this new pupal recovery technique, we found the majority of the husk fly pupae (85%) overwinter within the top 4 inches of the soil. Knowing the depth of the pupation is crucial to explore new methods of husk fly control in walnut orchards. Some of these options include the winter application of microbial or other conventional insecticides targeting the larvae or pupae in the soil, cultural practices such as disking, or others. Further work is needed to test the effectiveness of these potential options to control husk fly in walnut orchards.

Jhalendra Rijal, IPM Advisor, Stanislaus, San Joaquin, and Merced counties

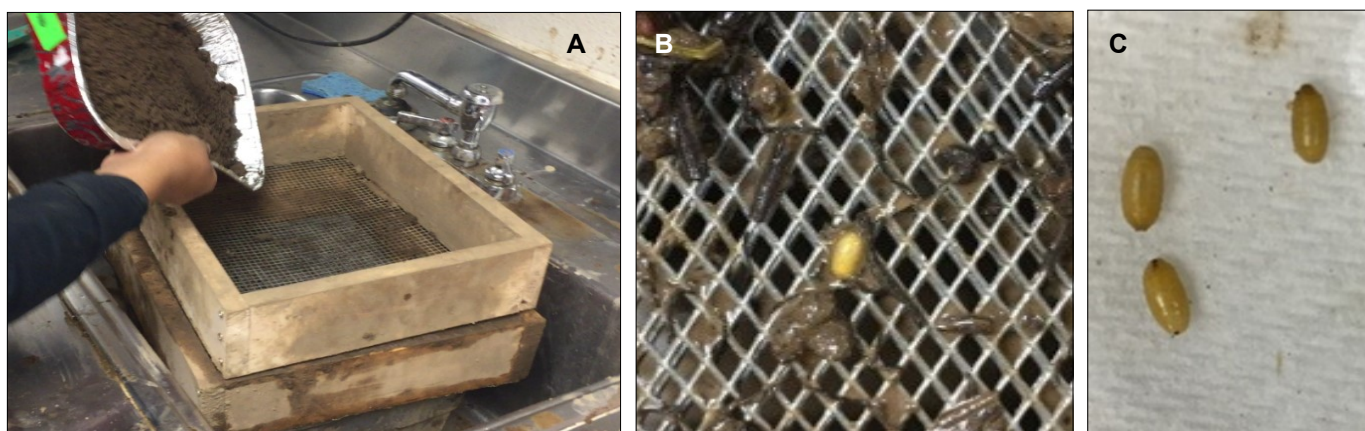


Fig. 1. Soil sample processing for the extraction of husk fly pupae from soil.

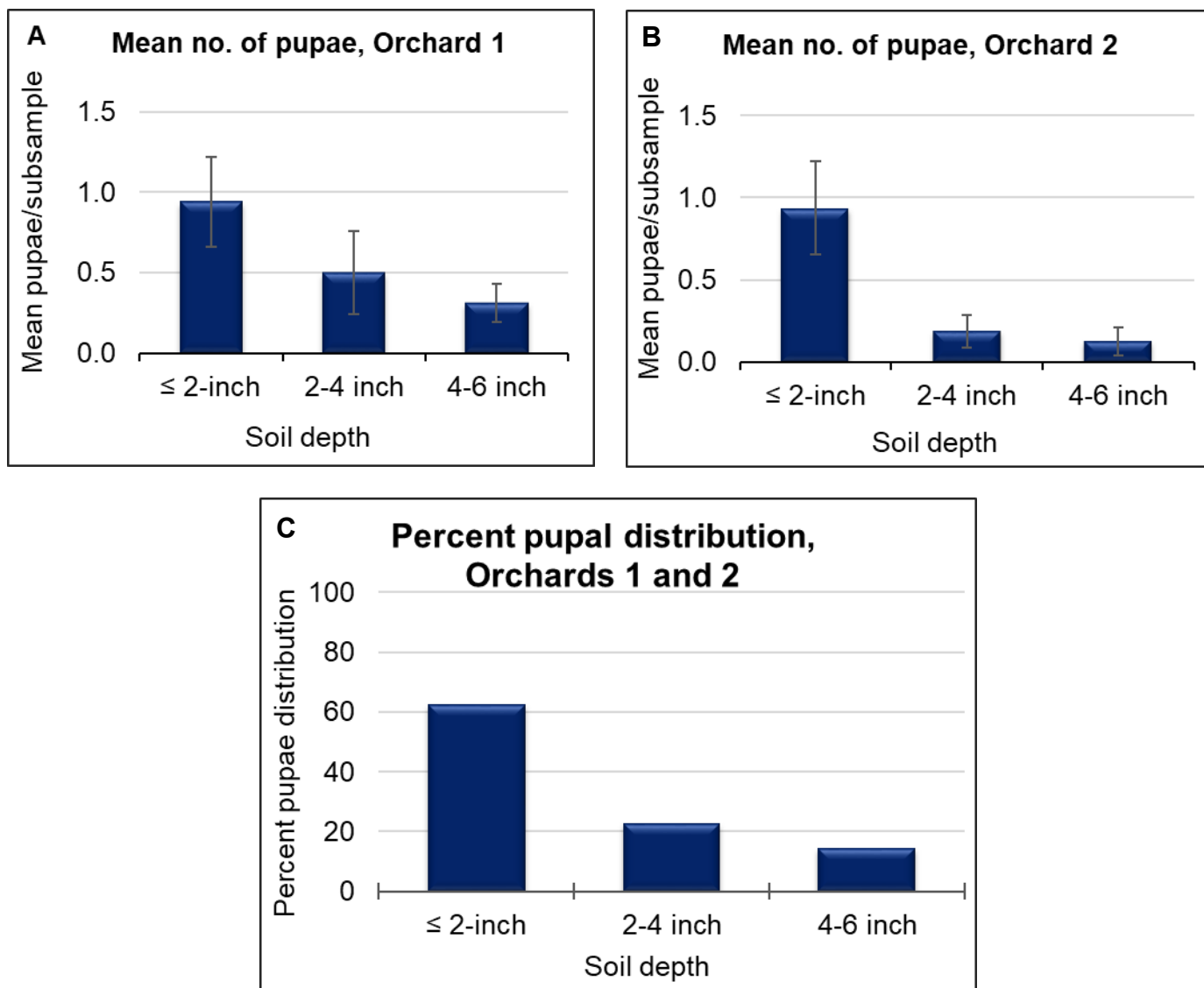


Fig. 2. Mean number of husk fly pupae per 3388 cm³ of soil, San Joaquin County, 2017

Cover Cropping Trial in the Delta

On June 5th, UC Cooperative Extension hosted the Small Grains and Soil Health Field Meeting on Staten Island in San Joaquin County (Figure 1). The meeting showcased the UC Davis wheat and triticale variety testing program for the Delta, which has been located on Staten Island the last two years. Additionally, Brenna Aegerter and I described an upcoming cover cropping trial that we will conduct on Staten Island. We were awarded a CDFA Healthy Soils Program (<https://www.cdfa.ca.gov/oefi/healthysouls/>) demonstration grant with our farm advisor colleagues in the Sacramento and San Joaquin Valleys – Sarah Light, Amber Vinchesi, and Scott Stoddard – along with Jeff Mitchell and Will Horwath at UC Davis. On Staten Island, we will evaluate legume cover cropping versus no cover cropping treatments for soil health properties, greenhouse gas emissions, and grain yield from 2018 to 2020.

The trial will take place in a field that is in small grains (wheat and triticale) rotations, with soil classification Valdez silt loam. Cover cropping will take place in the summer months following the small grains harvest. We will grow the

cover crop until ground work for the subsequent small grains crop needs to begin. In other words, it will be a relatively short cover cropping period (approximately 2 to 3 months), but it will take place at a time when the soil would have otherwise been fallowed.

We took initial soil samples on July 2nd following wheat harvest but prior to tillage to understand baseline conditions, and we will take subsequent samples at the end of each cover crop season over the three-year period to evaluate changes in soil properties. We will measure bulk density, pH, salinity, total C and N, aggregate stability, infiltration, and active C (a measure of the carbon available as an energy source for soil microbial communities) in the top foot of soil. We will also test bulk density and total C down to three feet. Greenhouse gas (N₂O and CH₄) monitoring will allow comparative evaluations of cumulative emissions between the soil management systems. Small grains yields will also be determined.

Our cover crop is 'Red Ripper' cowpea. Cowpeas germinate well and perform best if planted into a warm (≥65°F), well-drained soil. The field was pre-irrigated prior to plant-

(Continued on page 5)

ing the cover crop, which took place on July 30th. The soil temperature was approximately 70°F at planting. The seed was planted to moisture, approximately two inches deep, using a grain drill set to 7-inch row spacing. The seeding rate was approximately 50 lbs seed per acre. We suspect that weeds could be the most detrimental pests, and our goal is for good plant establishment to shade out weeds. Cowpeas, like other beans, are legumes that convert atmospheric nitrogen into plant-available forms, which may provide benefits for the subsequent small grains crops. We inoculated the seed with Guard-N® seed inoculant (Verdesian Life Sciences) to assist with this process. Cowpeas are moderately tolerant of salinity, which can be a problem in Delta soils.

We look forward to sharing trial results as we have them, and to conducting annual field days at the site. We want to thank Dawit Zeleke and Morgan Johnson at Staten Island, Margaret Smither-Kopperl and Valerie Bullard at the USDA-NRCS Plant Materials Center, and Tom Johnson at Kamprath Seed for their collaboration on this trial.

Michelle Leinfelder-Miles, Delta Farm Advisor



Figure 1. UCCE Small Grains and Soil Health Field Meeting held on June 5, 2018.

Announcements / Calendar of Events

USDA-NRCS Warm Season Cover Crops Field Day

Wednesday, August 22, 2018

10:00am-12:00pm

Lockeford Plant Materials Center

21001 N. Elliott Rd., Lockeford, CA 95237

See flyer on page 6, visit <http://plant-materials.nrcs.usda.gov/capmc> or call 209-727-5319 for more information.

UC Davis Dry Bean Field Day

Thursday, August 23, 2018

10:00am-12:00pm

UC Davis Agronomy Farm: Take Hutchison Dr. approximately 1.5 miles west from Hwy 113, in Davis. Turn south on Hopkins Lane, and then take the first left turn (heading east) onto a gravel/broken pavement road with a row of olive trees; park along the fence. The field is located north of the Bee Biology Center.

Contact: Michelle Leinfelder-Miles, 209-953-6100

Rice Experiment Station Annual Field Day

Wednesday, August 29, 2018

7:30am-12pm (lunch included)

Rice Experiment Station, 955 Butte City Hwy, Biggs, CA 95917

For more information, visit <http://www.crrf.org/>.

Alfalfa and Forage Field Day

Wednesday, September 19, 2018

7:30am-12:30pm (lunch included)

Kearney Agricultural Research and Extension Center, 9240 S. Riverbend Ave., Parlier, CA 93648

Contact: Michelle Leinfelder-Miles, 209-953-6100

Walnut Short Course

November 5-7, 2018

UC Davis, Activities and Recreation Center Ballroom

For more information see flyer on page 10 or, please visit:

<http://ucanr.edu/sites/WalnutShortCourse/>.

California Alfalfa and Forage Symposium

November 27-29, 2018

Reno, NV

For more information, please visit:

<http://calhay.org/events.html>.

Warm Season Cover Crops Field Day



United States
Department of
Agriculture

Lockeford Plant Materials Center, 21001 N. Elliott Rd., Lockeford, CA 95237

Wed., Aug. 22, 2018 - 10 am – 12 pm

Warm season cover crops are an underused tool in California agriculture. Their use can "add value" during a fallow "window" within a production cropping system. Advantages include: reduced soil erosion and increased water infiltration with fall rains, weed suppression, enhanced nutrient cycling, reduced soil compaction, and increased water holding capacity. Depending on the crops chosen, they may provide nitrogen and pest suppression.

These cover crops "winterkill" so there is no problem with cover crop termination for spring planting. The volume of residue produced and the ease of breakdown depends on the cover crop species.

Field Day participants will get a close look at a replicated warm season cover crop trial at the PMC with 11 species and four cowpea cultivars after 60 days of growth.

For more information or to arrange any special needs contact:
Margaret.Smith-Kopperl@ca.usda.gov or 209.727.5319
<http://plant-materials.nrcs.usda.gov/capmc>

Tentative Agenda

10:00 - Margaret Smith-Kopperl, PMC Manager - Welcome

10:05 - Scott Park - A Producers Experience with Warm Season Cover Crops

10:25 - Valerie Bullard, PMC Agronomist - Warm Season Cover Crops

10:50 - Gill Costa, Sentek Technologies - Moisture Sensors for Irrigation Water Monitoring

11:10 - Michelle Leinefelder-Miles and Brenna Aegerter, UC Extension - Cover crops, Soil Health and Greenhouse Gas Study

11:30 - Z. Kabir, NRCS Regional Soil Health Specialist - Timing of Warm Season Cover Crops

11:45 - Wendy Rash, District Conservationist - NRCS Programs and Cover Crops

11:55 - Margaret Smith-Kopperl - Conclusions and Questions

Helping People Help the Land

USDA IS AN EQUAL OPPORTUNITY PROVIDER,
EMPLOYER, AND LENDER

California Sorghum Silage: Nutrient Composition and Fermentation Characteristics

Sorghum is a summer forage option when water is short. In our ongoing project to have information on sorghum as a forage, silages from the 2016 harvest were sampled at feedout. Piles and bags were sampled from the exposed face, avoiding the ends.

Dairy profiles:

- Dairy size ranged from 320 to 5,550 milking cows.
- Farmed sorghum ranged from 42 to 574 acres.
- Sorghum type was forage (11 structures) and grain (5 structures).
- Sorghum was stored in either one of 12 piles or 4 bags; piles and bags were stored on dirt (50%) or concrete/gravel (50%) surfaces.
- Inoculant use was reported in 4 structures.
- All dairies utilized custom harvester services.
- Days ensiled at sampling ranged from 99 to 439 (median = 225 days).

Nutrient composition of sorghum samples is presented in Table 1. Fermentation characteristics are in Table 2.

Interpreting the numbers:

- There were no differences in nutrient composition or fermentation characteristics between grain and BMR type sorghum. Combined information is presented.
- Presence of sugarcane aphid infested material had no effect on nutrient composition or fermentation characteristics.
- In this data set, sorghum displayed lower levels of starch and Non-Fiber Carbohydrates (NFC) with higher fiber and ash content compared to typical California corn silages.

The take-home:

Sorghum quality was variable. Opportunities exist to improve California sorghum silage quality and management, as it may replace corn as an agronomic crop in years of water shortages.

Jennifer Heguy, Dairy Advisor, Stanislaus and San Joaquin counties
J.P. Martins, Tulare and Kings counties
Deanne Meyer, Livestock Waste Management Specialist, UC Davis

Table 1. Nutrient composition of California sorghum silage (n=16).

	% of DM							
	DM	CP	ADF	NDF	Starch	NFC	Ash	NDFD 30, %NDF
Mean	27.9	9.7	34.0	48.7	8.0	26.3	13.2	30.1
Median	27.6	9.5	34.2	49.1	6.9	26.5	12.9	29.9
Minimum	22.4	5.9	29.7	44.7	0.3	19.1	10.3	26.9
Maximum	35.2	12.8	39.2	55.9	18.7	34.3	16.9	34.9
STD	3.5	1.7	2.2	3.2	5.4	4.8	2.1	2.4

Table 2. Fermentation characteristics of California sorghum silage

	% of DM				
	Lactic Acid	Acetic Acid	Propionic Acid	Butyric Acid	pH
Mean	7.5	4.0	0.0	0.1	4.0
Median	7.6	4.1	0.0	0.0	4.0
Minimum	3.5	1.6	0.0	0.0	3.7
Maximum	9.8	6.6	0.3	1.3	4.3
STD	1.6	1.5	0.1	0.3	0.2

Pest Management Update for Tomatoes

Fusarium wilt continues to be the dominant problem I am seeing in local tomato fields. Although we have evidence from 2017 of a new *Fusarium* pathogen causing a crown rot disease, the classic *Fusarium* wilt appears to remain our greatest challenge. Work is underway on improved diagnostic tests, assessments of pathogen host range, evaluation of rotation crops, and soil survival. In local field trials, I am evaluating fungicides and biofungicides applied through the subsurface drip irrigation system. Because we now seem to have four or more *Fusarium* diseases in tomato, with confusing/overlapping symptomology, I would like to know about problem fields so that we can make sure we have an accurate diagnosis. This is important because while we now have some very good F3-resistant tomato varieties, this resistance is unlikely to be effective against the other *Fusarium* diseases – thus the importance of an exact ID to help inform variety selection for future seasons.

Broomrape (Figure 1) is a genus of parasitic plants which can attack many crops, but unfortunately seems to particularly plague tomatoes, and has occasionally been found in California tomatoes, most commonly in the Delta. In addition to the direct damage it does to the tomato crop, California growers have suffered losses due to mitigation measures mandated by state and federal regulatory agencies (e.g. not being able to harvest the crop, control measures, and not replanting fields to tomatoes). For more information, photos and links, please see the short post on the SJC and Delta Field Crops Blog at: <https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=27451>.



Figure 1. Broomrape flowering in Delta processing tomatoes in 2014.

Blackmold fruit rot can be a significant problem in late-season processing tomatoes, driven in large part by late-season dews, sunburning of exposed fruit and overripe fruit due to delayed harvests. We have learned from more than a decade of field trials conducted by Gene Miyao, UC-CE Farm Advisor, about optimum timings and materials. Despite the association of this disease with late-season conditions, Gene's research demonstrated that the optimum timing for fungicide applications is early, about six weeks before anticipated harvest. This means that for a

September 15th harvest, one should consider making an application around August 1 (now!). This may seem counterintuitive, since at this point the majority of fruit would still be green and thus not susceptible to fruit rot. However, repeated evaluations of various treatment timings support this finding. Many fungicides are effective against blackmold, but overall, chlorothalonil seems to be the most reliably effective. However, even the best fungicide only seems to cut the percentage of affected fruit in half (i.e. reducing from 7% of the fruit with blackmold to 3.5% of the fruit).

- If expecting a late-season harvest of a non-EFS/EFH variety, consider making a fungicide application six weeks before anticipated harvest.
- Try to avoid delayed harvest, as overripe fruit become particularly susceptible to fungal rots, regardless of the other factors mentioned above.
- As always, read the pesticide label and also check with your processor regarding any restrictions on fungicide applications to fruit.

Virus vectors continue to be a challenge, especially with the recent finding of Tomato Spotted Wilt Virus which can infect and cause disease in tomato varieties with the sw-5 resistance gene. In 2017, Bob Gilbertson (UC Davis) and colleagues continued to document the areas affected by this resistance-breaking (RB) strain which last season grew to include eastern Contra Costa County. I currently have a field trial in eastern Contra Costa in collaboration with the research group of Clare Casteel (UC Davis) and with funding from CTRI to look at reducing the attractiveness of tomato transplants to insect vectors. One approach that has shown some promise is to treat the transplants with an ethylene-inhibitor at the greenhouse, just prior to planting, which should be an affordable treatment. This has been shown to reduce both transplant shock as well as the number of visits by insects, and thus, hopefully also should reduce virus transmission. Stay tuned for results in a few months!

Tomato powdery mildew pressure was less in 2017, but from what I am hearing, it is back with vengeance this season. Hopefully our current heat wave, while not ideal for fruit set and sizing, will at least have the silver lining of suppressing mildew increase. From my eleven years of powdery mildew field trials, the top-performing group of fungicides (reliably top-ranked in any trial) have been: sulfur dust, Rhyme (FRAC group 3), Luna Sensation (7 + 11), Priaxor (7 + 11) and Quadris Top (3 + 11). I recommend that you develop a good rotation program which either incorporates sulfur dust in between fungicide sprays or rotates between products in different FRAC groupings. Many of the new products are formulated mixtures of fungicides in different groups (e.g. Group 7 active ingredient plus group 11 active ingredient). The thinking is that these combination products should help reduce the risk of resistance development.

We continue to see a mixture of two pathogens attacking tomatoes in our region. The first mildew is *Leveillula tau-*

(Continued on page 9)

(Continued from page 8)

rica, which is the more familiar of the two, with its bright yellow spots and often sparse sporulation (although sometimes sporulation is abundant). The second species is *Oidium lycopersici*, which exhibits the more abundant white sporulation for which the powdery mildew group was named. This mildew was first documented in California tomatoes in 2015. Thus far, it has only been found in the northern San Joaquin Valley and southern Sacramento Valley.

Brenna Aegerter, Vegetable Crops Advisor

Livestock and Natural Resources Update

Ranchette Livestock/Poultry Owner Animal Health Meeting

University of California Cooperative Extension and Vet Med Extension, School of Veterinary Medicine, would like to hold a series of workshops throughout Northern California to provide you with information on animal health and biosecurity, antimicrobial use, and ways to comply with new federal and state regulations on antimicrobial use. We believe these topics could be of great benefit to current and prospective small-scale and backyard livestock/poultry owners.

If you are interested in attending a workshop like this, please fill out the short survey at the link below so that we can better tailor the workshop to your preferences and interests. Filling out this survey does not obligate you to attend: <http://ucanr.edu/survey/survey.cfm?surveynumber=24973>. For more information, please contact Jasmin Bardales (jabardales@ucdavis.edu), School of Veterinary Medicine, or Theresa Becchetti, UCCE Advisor, Stanislaus & San Joaquin counties (tabecchetti@ucanr.edu).

Confined Bovine Feeding Operations

Recently, the Regional Water Quality Control Boards made changes to Confined Animal Feeding Operations. The regulations are for cattle only and lower the animal units to 6 to trigger this regulation. The key word in the regulations is commercial – which then excludes 4-H and FFA animals as well as any operation that may feed steers for their own family purposes even if the number is over 6. There are also numbers of days per month and per year that will trigger the regulations, so if you seasonally need to move cattle to your barn for short periods of time, you do not trigger the regulation. Below is a diagram to help you determine if your operation needs to comply with the regulations.

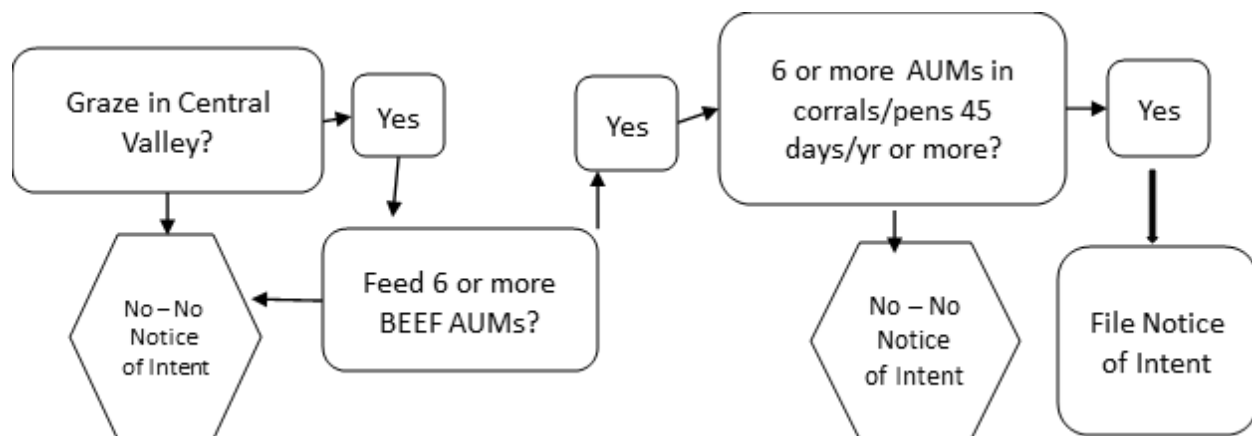
Water Diversion Short Course

With the passing of Senate Bill 88, UC Cooperative Extension has developed a short course to help certify ranchers to monitor their on-ranch diversions from either a creek or river for irrigation or for containment in a stock pond. We will hold a meeting this fall at the Gene Bianchi Community Center in Oakdale. The agenda and registration information will be sent out once a date is confirmed. For more information, please contact Theresa at 209-525-6800.

Gene Editing Survey

Hey farmers!! Some researchers at UC Davis are looking to do a half hour interview with you about gene editing, and for your time you get a \$25 Amazon gift card!!! Please sign up here: <https://innovativegenomics.org/PAGE/> and have the farmer voice be part of the conversation.

Theresa Becchetti, Livestock and Natural Resources Advisor, Stanislaus and San Joaquin counties





Walnut Short Course

November 5-7, 2018

Plan to join us for this integrated orchard management short course featuring UC faculty, Cooperative Extension specialists and farm advisors, and USDA researchers who will provide an in-depth, comprehensive study of all phases of walnut culture and production.

The program is based on the latest information and research and will cover the fundamental principles that form the basis for practical decisions and include Q&A for each session, quality time with instructors and networking opportunities.

Who should attend: New and experienced growers as well as other industry members interested in commercial walnut production.

Register to learn about:

- Orchard planning, design and development
- Walnut variety and rootstock selection
- Evaluation and modification of water and soils
- Tree propagation, training, pruning and canopy management
- Tree and root physiology
- Bud development and pollination management
- Irrigation scheduling
- Proper use and maintenance of irrigation systems
- Mineral nutrition and fertilization
- Cover crops
- Management of weeds, vertebrate pests
- Integrated pest management of insects and diseases
- Considerations for replanting orchards
- Quality & harvest concerns
- Organic production
- Economics of walnut farming and marketing

Registration available
September 1

Registration includes:

- Three Full Days of Instruction with over 45 Presentations
- Binders with presentations
- PCA & CCA credits (pending approval)

ARC Ballroom
UC Davis
Davis, California

For more information visit

<http://ucanr.edu/sites/WalnutShortCourse/>

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The University of California working in cooperation with San Joaquin County and the USDA.