Economic Impacts of Recent Wildfires on Agriculture in California

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Economic losses from fire are large, varies and complex. But, before turning to agricultural economic losses we must first be clear that the dominate consequences have been the loss of life and serious injury to individuals in both rural and urban areas. In addition, loss of homes and personal treasures represent much more than monetary loss to the people affected.

California wildfires have meant personal tragedy for individuals and families throughout the state. Many farm families, including farm owners and operators and farm employees are among those who suffered tragic losses, including deaths and loss of homes. Calculating the economic impacts of those losses is beyond the scope of the data presented below.

Here I consider only the reduced capital value of productive farm assets and loss of agriculture income flows caused by wildfires in recent years. This is just a part of a larger whole.

It is important to state at the outset that I do not have and have not seen any up-to-date aggregate assessment of agricultural losses from recent wildfires. The most recent round of fires is too new to have complete data, and even for older fires the impacts are so disparate we may never have a full set of economic models and calculations that covers all losses. In that context, it is vital to highlight examples of specific impacts, which provides vital human context to dry calculations.

Farm Income and Assets in California

A few baseline facts are useful to put fire losses in perspective. In 2019, California generated gross farm incomes of about $53.7 billion and paid about $12.3 billion for employees and contract labor working on farms. Net returns to farm operators was about $10.2 billion.

Based on the 2017 Census of Agriculture, the value of farm and ranch land and buildings was about $229.4 billion. The value of machinery and equipment was about $11.7 billion. Farmland base was 24.5 million acres, with about 8 million acres of harvested cropland and about 13.2 million acres of pasture.

Estimating Fire Losses in California Agriculture

The line between agriculture and the rest of the economy is never easy to draw. Here we focus on farm losses. That means I do not provide data on losses of processing and marketing facilities. The broader agricultural losses are much more extensive. For example, when a warehouse or food processing facility is damaged that is part of the broader agricultural loss, but data I have seen do not allow us to tally those separately from other commercial and manufacturing losses.

Some data are available to help quantify some of the economic losses in the large and devastating fires of 2017 and 2018. The agricultural economic losses associated with fires in 2019 and 2020, may be gauged roughly use some estimates and ranges from the earlier fires.

Accounting for numbers of acres and structures burned are only a starting place of assessing economic damage. For example, the deadly Camp fire burned about 150,000 acres of land and destroyed almost 19,000 structures in November 2018. Although rural, the Camp fire mostly damaged non-agricultural land and structures. Most of the agricultural land affected, mountain and foothill pasture and rangeland, had light livestock numbers and was able to recover over the winter most of its grazing productivity. Relatively few farm structures or acres of tree, vine or other intensive crops (less than 200 acres) were damaged in that fire. Agricultural economic losses, in the range of about $5 million, are not the reason that fire was so devastating.

The Thomas fire in 2017 and more recent fires in Los Angeles, Ventura and Santa Barbara Counties affected major agricultural production regions. Much of the land affected, several hundred thousand acres was non-agricultural, but many acres of range and pasture land was also burned. Losses on the rangeland was significant to the ranchers affected but the largest agriculture economic losses were caused by damage to high-value irrigated crops.

Soon after the Thomas fire, the Ventura County Agricultural Commissioner estimated that the Thomas fire had affected about 60,000 acres of pasture and about 10,000 acres of irrigated cropland, including, especially avocados (more than 6,000 acres) and citrus, but including other vegetables, other fruit and nursery and flower crops. The Commissioner estimated that direct agricultural economic losses totaled about $70 million, and caused an additional $100 million in loss of farm dwellings. Loss of the value of the avocado and citrus crops on the trees at the time of the fire was about $10 million for each category. Capital loss to the value trees and agricultural structures, facility and equipment accounted for the bulk of the other $50 million in agricultural economic loss. This estimated total was preliminary, probably underestimates the loss from damaged orchards and groves, and did not include loss of wages to farm workers.

The Northern California fires of 2017, centered on the North Bay Counties (about 200,000 acres) and Yuba and Butte Counties (about 25,000 acres) also had devasting economic impacts. Much of the agricultural acreage affected was rangeland and pasture, where damage to fences, ranch structures, facilities and equipment were the most important losses, which, based on an estimate of replacement of fencing and structures likely totaled around $10 million.

The largest crop losses from these fires was in tree and vine crops, with grape vineyards suffering the largest acreage loss and also the highest value of loss per acre. The loss of trees or vines may be calculated based on replacement costs and lost net value of harvests, or we can use the data on sales values of operating vineyards of a given location minus the value of vineyard land. In Napa County, for example, value of vineyards has a wide range, but overall lost vineyard acreage has an average value in range of $100,000 per acre. Less prominent regions of the North Coast decline from there to less than $20,000 per acre. Even if vines survived fire sometime expensive trellises and irrigation systems required replacement. Fortunately, irrigated vineyards and orchards do not burn readily and so most survived with only modest damage. Data suggest

that about 500 acres of vines were within the fire perimeters. Using an average vineyard value of $50,000 per acre, losses for vineyards were likely in the range of $25 million. About 100 acres of orchard crops were within the perimeters and at a rate of $20,000 per acre, the loss of orchards was in the range of $2 million from these 2017 fires.

These vineyard losses do not include the loss of winery structures, even those located near the vineyards, which was likely substantially higher than the loss of the vineyards. A small share of the many hundreds of North Coast winery structures were destroyed in the 2017 fires. However, some of those were quite valuable and included retail establishments as well. Farms also lost equipment and related capital when structures were damaged. It is likely that losses of wineries and related facilities exceeded the financial damage to vineyards.

The losses for annual crops were smaller because crops were already harvested and acreage affected was generally small. Individual operations had losses that caused much financial stress for the those affected. Loss to pasture fencing and livestock structures covered many acres. However, the replacement of that infrastructure is modest on a per acre basis. Farms reported relatively few livestock deaths from these 2017 fires, with total loss in the range of $1 million.

Almost all crops had been harvested by the times of these 2017 fires, with the important exception of some of the most valuable red wine grapes in the North Coast region. Smoke taint is relatively minor for most crops, but is a major concern for winegrapes, especially high-priced red winegrapes. Even if salvageable, there grapes were worth far less per ton than they would have been and in many cases were not worth harvesting, even from vineyards that had no direct fire damage. Based on fire perimeters, smoke patterns and share of grapes unharvested I estimate that about 2,000 acres of grapes were affected. Using a rough average yield of 5 tons per acre (which is too high for some of the high-priced grapes) we get a total of about 10,000 tons of grapes lost to smoke taint or lack of opportunity to harvest. Average prices range from almost $10,000 per ton (for red grapes in the Napa Valley) down to around $2,000 per ton in outlying areas. Using a median figure of $5,000 per ton for an average the loss to unharvested grapes were in the range $50 million.

Farm Economic losses from the 2020 fires have been different for several reasons. First, major fires occurred as early as August which is prime harvest season and even before harvest for many crops. Thus, the potential agricultural losses exceed the 2017 and 2018 fires. That also means farm workers had major potential losses in missing jobs during harvest. Second, the 2020 fires have been more widespread covering agricultural regions throughout the state from the far south to the far north and from west to east. The North Coast areas have been hit again and this time more wineries were affected directly and the fires occurred when more winegrapes were vulnerable to smoke taint. The aggregate assessments for recent fires is remains incomplete. Assessing farm and other agriculture damage is complex and hard to separate from other losses in commercial and manufacturing business. It is important to gather the needed data on a fire-by-fire basis and aggregate that information to have an objective data-based estimate of farm and broader agricultural losses from California wildfires.

California Animal Response Emergency System (CARES)

Announcing the CARES Website for Stakeholders and the Public

Animals play an integral role in society. In many homes, pets are considered to be members of the family. Working animals provide valuable services to the community and production livestock contribute millions to the economy. It is no wonder then, that when disaster strikes, citizens are intensely concerned about their animals. Numerous studies have shown that people are reluctant to evacuate during a disaster without their animals. Images like the one here, of "Rodeo", a Border Collie stranded on a roof in the 1997 Yuba floods, make a lasting impression and cause the community to ask, "What is being done for animals during disasters?" To answer, the State of California has created the California Animal Response Emergency System (CARES) through the joint efforts of the California Governor's Office of Emergency Services (Cal OES) and the California Department of Food and Agriculture (CDFA).

California is home to nearly 19 million domestic animals. Polls conducted in 2012 estimate that California is home to 6.7 million dogs and 7.1 million cats. The California Department of Food and Agriculture reported in 2012 that there are over 5.5 million cattle in California, 570,000 sheep, 141,000 goats, 670,000 horses, just over 100,000 hogs, and millions of chickens in the Golden State. Approximately one out of every three households in California owns a dog or a cat.

The California Animal Response Emergency System (CARES) is an operational guidance to assist with all aspects of animal care and control in the event of a disaster or emergency. In addition, CARES provides resources for the public, for animal businesses, for shelters, and for emergency planners. CARES is structured in accordance with the Standardized Emergency Management System (SEMS) and the Incident Command System (ICS). Learn more about CARES here.

NO BOUNDARIES FARM

HIGH QUALITY HEMP PRODUCTS

NO BOUNDARIES FARM:

A Before and After of complete devastation

THIS IS OUR STORY...

by Eddie, Blake & Brooke Campos

BEFORE THE VALLEY FIRE:

In October 2019, The Campos Family obtained their Industrail Hemp Cultivation License with San Diego County. We're a small family-owned, locally grown business known as No Boundaries Farm based in Jamul, CA specifically Lawson Valley. Our Owners, Eddie Campos, Blake Campos and Brooke Campos have resided around the small community of Jamul for over 20 years.

No Boundaries Farm 2 weeks before the Valley Fire.

When Eddie purchased the 40 Acre property (now known as No Boundaries Farm) 4 years ago, there was plenty of land that remained vacant, Eddie worked hard with the County of San Diego to get our land registered and licensed for the cultivation of Agricultural Hemp. We were approved for 6 Acres of Hemp Cultivation on our property.

No Boundaries Farm CBD product line including Vegan Gummies and Capsules, CBD Oil Tinctures and topicals including Roll-On and Balms

This business held a very close and special place in all of the Campos' Family's hearts as our Mother (Eddie) and Grandmother (Blake and Brooke), Mary, was diagnosed with COPD a few years prior. In March of 2019, "Gramary" was only given a few months to live, so an extremely determined Eddie knew that she was a fighter and there was more that we could do for her than to just provide hospice and "make her comfortable". We were provided information to a holistic clinic in Mexico (as we didn't want to follow the Western Medicine practices) , the next week Eddie drove down there with all his mother's medical records and spoke with the doctor on what steps he could take to help prevent the detrimenting disease from taking over, he was provided strict instructions on feeding her the best high-quality food that could be provided, all oragnic homemade carrot juice and plenty of legal CBD/THC products to help relieve her pain and anxiety to help keep her calm.

The family started her on the reccommended care, she lived on for another 1.5 years; the holistic and plant medicine approach allowed her to live on and spend another 18 months loving her family and enjoying all the chaos and happiness that the family brought her - she even hung on long enough to spend her 60th Wedding Annniversary with her beloved husband, Gilbert and her family.

No Boundaries Farm was awarded 1st place in "Best Overall" and "People's Choice" Hempflower at the SDCFM Farmers Cup 2020.

BEFORE THE VALLEY FIRE CONTINUED...

No Boundaries Farm was started and inspired by our "Mother Mary" and the matriarch of our family, everyday on our was designated to her and the plant that we were able to experience make the biggest difference in one woman's life, we know first hand the positive impact that the hemp plant can have on a human's life and we were determined to provide CBD products in any way that we can to hopefully help make a difference in another one's life.

Valley Fire cresting our property on 9/5/2020 at 7:04PM

Unfortuneately in our first year as a small business, we've experinced quite a bit and it's been an extremely trying year for us. First, a global pandemic that shut down a lot of businesses, including a lot of doors and opportunities to other hemp farms and helping each one of us in making a difference in the world. Secondly, we lost "Mother Mary" on August 7, 2020 and have been trying to grieve and cope with her loss as a family while staying focused on the business and not giving up and continuing her legfacy on through No Boundaries Farm. Thirdly, came September 5th, 2020...**The Valley Fire,** where unfortunately our Farm was hit hard by the erupting fire in it's early stages.

Valley Fire taking over our property on 9/5/2020 at 7:09PM

DURING THE VALLEY FIRE:

On the afternoon of September 5, 2020 at approximately 2:30 PM, one of our team members spotted smoke on the hillside behind our property. As the hours progressed, the smoke grew increasingly close to our propoerty line. At approximately 7:05PM, the 60'-70' flames were spotted peaking over the hills of our property line. Both Eddie Campos and Blake Campos along with a few of our team members did their best to fight the fire from our farm, and drench every building and the ground around them to do the best they could to save our farm, knowing that the Valley Fire was on it's way towards us.

Our whole team fought the flames bravely on the front lines for nearly 5 hours, until the last moment when we had to abandon ship and escape from the valley to save our own lives. We're fortunate enough that everyone made it out alive with no physical harm. We were also lucky enough to save the lives of 8 horses, 9 dogs, 9 chickens all while our hillside was engulfed in flames.

It was still rapidly expanding and out of control with minimal containment, there was no air support when we were thus fighting the far due to extremely low visibility.

AFTER THE VALLEY FIRE:

Overhead view of No Boundaries Farm facilities after the Valley Fire.

DEVASTATION is a word that is still an understatement, it's unfathomable to comprehend how we feel especially with all the uncertainty that surrounds the future of our small business. But we've lost so much throughout the course of this great tragedy.

In our first year of business, not only have we faced the tragedy of trying to keep on moving forward being a small business during a worldwide pandemic (that unfortunately many small businesses didn't survive), additionally we just recently lost the inspiration and reason we began our business exactly a month ago; our mother/grandmother, Mother Mary, passed away after a long roller coaster health battle with COPD... Due to this fire we've now lost everything that we've worked hard for in building a fully legal and licensed hemp farm from the ground up, during the first year federally legal hemp cultivation.

We've lost all of our equipment and tools, all indoor our grow rooms and structures, our barns and our office space, our entire inventory of CBD products, majority of our crop, all of our merchandise and packaging, smokeable flower, and supplies. Overall we've lost over $700k of investment into this business, not to mention the labor and man hours over the last couple of years. We truly have lost everything as we were unable to acquire fire insurance even after trying multiple times with at least 4 different insurance companies. We were continually denied coverage due to our rural high risk location...

Brooke, Eddie & Blake Campos standning in the rubble of No Boundaries Farm.

This property was not only our business but also our home, where 5 people permanently resided on the property. 3 of them have lost everything that they have in the Valley Fire that burnt their entire house to the ground including their photo albums and memories, entire food supply, clothing items and every personal belonging that you can think of needing on a day to day basis.

WHATS NEXT FOR NO BOUNDARIES FARM?

We have setup a GoFundMe to help recoup some of what we need to get our feet back on the ground and any bit is much appreciated. Thank you for the continued support, we'll keep everyone updated as we continue on our rebuild journey. We appreciate you, our silver lining is in our outdoor crop, scheduled to be harvested soon

Some of these funds will also be dispersed to help us build an even bigger and better structure for our pet pig, Bruce, who miraculously survived while stubbornly refusing to get into his trailer and he stayed on our property while it was being scorche in the Valley Fire.

A long road to rebuild but we appreciate all the support that we've received from everyone already. Thank you all so much from the bottom of our hearts. **We will be back even stronger.**

One of our hemp CBD plants affected by the Valley Fire with a few more plants in the background.

Here is the aftermath of the devastation and destruction that No Boundaries Farm faced in the 2020 Labor Day weekend's Valley Fire. The Fire was finally extinguished after 20 days and 16,390 Acres were burned.

A closeup view of one of our outdoor hemp plants with a scorched hill in the bavckground

The remanants of our No Boundaries Farm CBD product lineup.

Our friends and family assisting with cleanup & rebuild of our farm, restoring power.

Blake Campos and Eddie Campos stand in front of the barn space that used to house our offices, clone storage and mother rooms.

Our pet pig, Bruce, standing in front of his scorched shelter while proudly wearing a No Boundaries Farm hat. #BruceThePig

Here is a financial breakdown of our losses from the 2020 Valley Fire.

CROP DAMAGED	% LOSS	ESTIMATED $ LOSS
Hemp Outdoor 1 pound per plant 4 foot on center 5000 plants x $150lb	**25%**	**$190,000**
Clones Indoor 20,000 x $4 per clone	**100%**	**$80,000**
Seeds 40,000 x $1	**100%**	**$40,000**
Mothers 1000 x $100.00	**75%**	**$80,000**
CBD products: oil, rubs, balms, tinctures, gummies, flower	**100%**	**$60,000**
OTHER DAMAGE	**# LOST**	**ESTIMATED $ LOSS**
Dwellings and Service Buildings	**2**	**$400,000**
Structures	**1 at 2000'**	**$200,000**
Land Damages	**37 Acres**	**$150,000**
Machinery and Equipment	**Tools & Grow Equipment, office**	**$400,000**
TOTAL		**$1,600,000**

To assist in any funding for No Boundaries Farm, we have a setup a GoFundMe account to help offset the costs that we've lost. Scan the QR code below or follow the link to visit our GoFundMe page.

www.gofundme.com/f/no-boundaries-farm-rebuild

NO BOUNDARIES FARM

HIGH QUALITY HEMP PRODUCTS

#NoBoundariesFarm
#NBFrebuild

Wildfires multiply ranchers' woes, scorching range

Issue Date: October 28, 2020

By Ching Lee

With California ranchers already squeezed by shrinking availability of grazing land, the 2020 fire season—the largest the state has recorded—deals mounting uncertainties about where to place their livestock and how to sustain them.

The more than 4 million acres that have already burned in the state this year consumed "a big portion" used for cattle grazing, including public and private rangelands, said Mark Lacey, president of the California Cattlemen's Association.

Lacey, who manages cattle in Inyo, Mono, San Luis Obispo and Kern counties, pointed to blazes such as the SQF Complex in Tulare County and the Creek Fire in Fresno and Madera counties as having "a tremendous impact" on pastureland and livestock.

The North Complex fire in Plumas National Forest in Butte County, in particular, has received much attention in the ranching community because of the "devastating, major loss of livestock" suffered by the association's past president, Dave Daley, Lacey added. In a published account of his experience trying to recover cattle from that fire, Daley reported losing more than 300 head of cattle and a "legacy" that has been in his family for six generations.

Total statewide losses and damages for ranchers remain unknown, as recovery and assessments continue in burned areas, but initial estimates are starting to emerge in areas where fires are contained.

For example, cattle, forage and ranching infrastructure losses from the SCU Lightning Complex fire, which burned 396,624 acres of primarily rangeland in Alameda, Santa Clara, San Joaquin, Merced, Contra Costa and Stanislaus counties, reached an estimated $68.2 million, according to an initial "conservative" assessment by the University of California.

In their calculations, UC Cooperative Extension livestock and natural resource advisors Theresa Becchetti and Sheila Barry reported that damaged or destroyed fencing represented the biggest financial loss, at $33.3 million. They estimated cattle losses at more than $20.2 million, which includes deaths and production losses, and forage damage at $18.4 million. Other losses include $14.5 million for stock ponds and water systems, and more than $1 million for corrals. Their assessment did not include damage or losses to roads, cabins, barns and other buildings.

Becchetti said local Farm Service Agency offices are just beginning to gather data and process funding, and that it will take time before more accurate numbers become available.

With more pastures being converted to other agricultural or urban uses, and as fires claim more land used to raise livestock, Lacey said ranchers are left with "very limited options as far as finding more feed." They could try to find other grazing ground to lease, he said, including moving cattle out of state,

but added "that's not real likely," as California and most other Western states have suffered dry weather that has zapped forage this year. Some ranchers may choose to feed hay until rain produces more grasses, but he noted that would be a "fairly costly" short-term option.

As a last resort, ranchers will sell cows, Barry said, noting that most ranchers want to keep their herds, as they have worked to select and develop animals that work well for their ranch, know the range and have a proven performance record.

"The sad part is, it may force people to liquidate some cattle," Lacey said. "We've seen over the past 10 years, as either droughts or fires have impacted ranchers, some folks have not reentered the business."

It remains unclear how the U.S. Forest Service and Bureau of Land Management will respond to burned areas they oversee, Lacey said.

Historically, there has been a blanket rule of no grazing on federal allotments for two or more years after a fire. However, that policy has been challenged, as research has shown "minimal" or "neutral" impact from grazing one year after landscapes are affected by fire, said Tracy Schohr, UCCE livestock and natural resource advisor for Plumas, Sierra and Butte counties. Decisions on post-fire grazing will depend on factors including location and quality of the range, type of habitat in the area, rainfall, and intensity and timing of the fire, she added.

"There's not a one-size-fits-all approach," Schohr said, noting that after the 2018 Camp Fire, she encouraged ranchers to graze burned pastures at reduced stocking rates the following spring, to control weedy grasses that can quickly take over annual grasslands.

With the state's disaster declaration, Lacey said ranchers who have insured their livestock may be able to recover some losses, such as from the Livestock Indemnity Program.

Going forward, what ranchers really need, he said, is for "state and federal governments to stop just blaming climate change for everything and start coming together with land resource managers and livestock people to figure out how we're going to change the dynamic of letting the state burn up every year."

"I'm not saying climate change doesn't exist," Lacey added. "I'm saying if this is the new norm, if these are the conditions that we expect going forward, then we need to get creative and we need to change what we've been doing."

He lamented past and ongoing litigation by environmental groups that block projects to manage forest fuel loads and improve fire protection, not just for rangelands but for towns and cities. He also emphasized the need for regulatory relief from agencies such as the California Air Resources Board, which places restrictions on how much prescribed burning can be done in a given year. Amending the federal and state Endangered Species Acts would also help with fuel reduction and forest thinning, he added.

"We need Cal Fire to … stop being so much in the business of fighting fire and be more in the business of fire protection and public safety" by doing more offseason fuel reduction, Lacey said.

Furthermore, the Forest Service needs to decide what it plans to do about post-fire cleanup, he said.

"I don't think we can afford to leave that much bare land without doing something with it and stabilizing the soil, so that we don't see a huge amount of erosion or flooding post-fire," Lacey said.

(Ching Lee is an assistant editor of Ag Alert. She may be contacted at **clee@cfbf.com**.)

Up in smoke: California wine country counts cost of wildfire damage — Metro US

Sign up for our COVID-19 newsletter to stay up-to-date on the latest coronavirus news throughout New York City

(Reuters) – When a wildfire swept down California's Napa Valley in August, winemaker Patrick Elliot-Smith stayed put, fighting the encroaching flames with water pumps and laying fire breaks around his vines in a battle with nature that lasted three days.

He and his son managed to save their family-run Élan winery in the valley's Atlas Peak appellation.

But smoke damage from the LNU Complex fire was so bad that they – along with dozens of other wineries damaged or burned down by some of the worst U.S. wildfires in living memory – decided not to harvest any grapes this year or sell fruit to other producers.

"We cannot afford a bad vintage," Elliot-Smith told Reuters. "It looks like a lunar landscape here."

When smoke is absorbed into a vine and concentrates in the fruit, it alters a grape's chemistry and ultimately its taste, leaving some wines with "ashtray aromas" that may appear during fermentation or even as late as after bottling.

Smoke has blanketed much of the U.S. West and fires have charred more than 4 million acres (1.6 million hectares) in California so far in 2020, more than twice the previous record for any year.

The still active Glass Fire has destroyed dozens of buildings, including the mansion-like Château Boswell winery and a farmhouse containing storage, bottling and fermentation facilities at the Tuscan castle-style Castello di Amorosa.

Both producers' premium reds sell for upwards of $200 a bottle.

The Newton Vineyard winery also went up in flames, according to a Reuters photographer who visited the site, observing rivulets of red wine mixed with ash flowing down its main access road.

HUNDREDS OF SMOKE TAINT CLAIMS

Susan Meyer, owner of RustRidge Winery, said her crop was a write-off "both from the fire itself and the smoke that lingered for days. Many plants were burned by fire but others died from the heat exposure," she said.

Her insurance provider alone was dealing with 600 claims for smoke taint, she added.

The true impact on a $70 billion-a-year national industry centred in California, Oregon and Washington state will not be known for months as the wildfire season is not yet over.

While grapes picked from the vine before exposure are safe from smoke taint, many winemakers with as yet unpicked harvests are awaiting the results of smoke testing from backlogged wine laboratories before deciding whether to proceed.

A notice this week on the website of Napa Valley-based ETS Laboratories warned of a wait till November for new tests.

Its co-founder and technical director, Gordon Burns, said it was too early to speculate as to the overall damage.

"Every location is different, and smoke exposure may be transitory and as little as none at all. Any fire impacts will certainly not be to the entire vintage in any of the affected winegrowing regions," he added.

Eric Jensen, owner of Booker and My Favorite Neighbor wineries in California's Paso Robles region, said he expected his crop to have escaped damaged "because of the distance that the smoke traveled to get to us.

"But in Napa and (neighbouring) Sonoma, the proximity is causing issues."

Further North in Oregon's picturesque Willamette Valley, Jason Hanson of Hanson Vineyards expects his crews may only harvest five tons of grapes, down from at least 25 last year, due to smoke taint from nearby fires.

"With the dense smoke that we've had at the ground level for so long now, almost everything has to be affected or damaged," Hanson said.

"I have a yearly fight with the birds. This year I'll just let them win."

(writing by John Stonestreet)

FILE PHOTO: Helicopter drops water over the Glass Fire in Calistoga, California

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https://www.metro.us/up-in-smoke-california/

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November 16, 2020

Assemblyman Robert Rivas, Chair
Assembly Committee on Agriculture
State Capitol, Room 5158
Sacramento, CA 95814

Dear Chairman Rivas:

California cattlemen own or manage much of the state's 38 million acres of rangelands, rendering beef producers a key partner in land management, including wildfire prevention. California's ranchers have been particularly hard-hit by this year's unprecedented wildfires: in addition to losing thousands of acres of pasture and hundreds of cattle, ranchers have been forced to watch as this year's fires decimated the homes, infrastructure, and economies of the rural areas they call home. The North Complex Fires in Plumas and Butte Counties, the August Complex Fires throughout the Coastal Range of Northern California, the SCU Complex Fires in the Bay Area, the Creek Fire in the Sierra National Forest, and dozens of other blazes throughout the state have devastated ranchers and their neighbors.

To avoid similarly devastating wildfire seasons in the future, CCA urges the California Legislature and relevant regulatory agencies to enact policies which **significantly increase the use of prescribed fires** and **utilize livestock grazing as a method of fine-fuels reduction.**

To ensure landscape health and wildfire risk reduction, CCA has joined a broad coalition in requesting a $500 million January supplemental appropriation, including $50 million intended specifically for prescribed fire efforts, and will push for additional funding in the 2021-22 Budget. **However, it is insufficient to merely fund prescribed fire—California must ensure that those funds are efficiently utilized to apply 'good fire' to the landscape.**

Several policy actions can be undertaken by the Legislature and relevant agencies to efficiently ensure the application of 'good fire' to the landscape via prescribed burns:

- **Adopt a gross negligence liability standard for prescribed fires.** Burn bosses report that liability concerns—and attendant insurability concerns—are the single greatest disincentive to conducting controlled burns. While SB 1260 (Jackson 2018) provided that "compliance with a permit issued pursuant to this article shall constitute *prima facie* evidence of due diligence," this merely establishes a rebuttable presumption that the ordinary negligence standard has not been violated; it does not fundamentally alter the applicable negligence standard (moreover, the statute is presumably inapplicable to prescribed fires for which a CAL FIRE permit is not required). To ensure burn bosses are able to execute controlled burns—potentially preventing megafires—Health & Safety Code §§ 13007-13009.1 and

Public Resources Code § 4494 (and other applicable code sections) should be amended to adopt a gross negligence standard akin to that adopted by the State of Nevada.

- **Reduce the frequency of 'no-burn' decisions by air pollution control districts and air quality management districts**. CAL FIRE and private burn bosses frequently expend significant resources in planning controlled burns only to have air districts issue a 'no-burn' decision on the day of the planned burn due to health concerns relating to prescribed fire smoke. However, small-scale controlled burns produce much less air pollution than large-scale megafires, and emerging science demonstrates that controlled burns have far fewer health impacts than wildfires of similar size. Given that prescribed fires can reduce the incidence of far-more-harmful wildfires, policy should be implemented to reduce the invocation of 'no-burn' determinations for prescribed fires.

- **Exempt certain prescribed fire activities from CEQA requirements (or streamline CEQA requirements for those projects).**

In addition to policies which encourage the application of 'good fire' through prescribed burns, CCA urges the legislature and land management agencies throughout the state to **encourage increased livestock grazing as a wildfire risk reduction tool**:

- **Introduce (or reintroduce) grazing for fuels-management on state/county/municipal lands**. Recent research from UCCE San Benito demonstrates that livestock grazing is an effective wildfire prevention and mitigation tool, as livestock grazing reduces the size, spread, and severity of fires. While limited livestock grazing occurs on some DFW lands and within the State Parks system, grazing could be more broadly utilized on these public lands.
    - A significant barrier to increased grazing on state lands is the lack of infrastructure (e.g. fencing, water developments). This hurdle could be tackled by **earmarking state grant funds for infrastructure development** or simply by **providing for long-term grazing leases of state lands** (e.g. 20 years), ensuring that ranchers who invest in such infrastructure themselves can reap the benefits of that infrastructure.

- **Utilize post-fire grazing to manage fine fuels after prescribed burns or wildfires**, ensuring that the land does not re-burn due to accumulation of fine fuels.

There are numerous other policies that the state can and should prioritize to ensure landscape health and prevent future megafires—including clearing deadfall accumulation from this year's historic wildfires in a manner similar to what private operators such as SPI are doing. However, if California makes significant strides in the short term toward increasing our utilization of prescribed fire and livestock grazing as fuels treatments, the state will be well on its way to avoiding another 2020 Fire Season.

We thank you for convening an informational hearing on the wildfire impacts on California agriculture and we look forward to collaborating with you to usher in meaningful regulatory reforms and targeted investments that will help protect the state's resources and reduce wildfire severity in California.

Sincerely,

Billy Gatlin
Executive Vice President

cc: Members of the Assembly Committee on Agriculture

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

Targeted Grazing: A Primer for Landowners and Land Managers

By Dan Macon, Livestock and Natural Resources Advisor
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Introduction

Targeted grazing using sheep, goats, or cattle is being used increasingly to manage vegetation in a variety of settings. This primer is designed to help landowners, homeowners, nonprofit staff, and government agencies to understand the basics of targeted grazing.

What is Targeted Grazing?

According to the *Targeted Grazing Handbook*, "targeted grazing is the application of a specific kind of livestock at a determined season, duration and intensity to accomplish defined vegetation or landscape goals…. The major difference between good grazing management and targeted grazing is that targeted grazing refocuses outputs of grazing from livestock production to vegetation and landscape enhancement." (Launchbaugh and Walker 2006).

Targeted grazing contractors typically provide the livestock, fencing, staff, livestock watering equipment, predator protection, and other infrastructure necessary to safely and effectively manage livestock. By managing the type and number of animals, the duration of grazing, the season and frequency of grazing, and the spatial distribution of livestock, targeted grazing can help landowners and managers achieve a variety of land management goals.

Where is Targeted Grazing Effective?

Well-managed targeted grazing can be used to address site-specific landscape goals. Targeted grazing can impact specific invasive weeds (like yellow starthistle, medusahead or Himalayan blackberries). By controlling competing vegetation at specific times, targeted grazing can enhance habitat restoration efforts. Targeted grazing can reduce or modify fine fuels and ladder fuels to reduce wildfire danger in many environments. Indeed, targeted grazing and prescribed fire are the only fuels treatment methods that actually remove fuel.

Typically, targeted grazing is a cost-effective vegetation management alternative where other options are ineffective. Specifically, targeted grazing can be more cost effective on landscapes that are too steep, rocky, or remote for conventional vegetation management (like mowing or chemical treatment), or in the urban-wildland interface where burning is not an option.

Managing Animal Impacts

Grazing livestock have three basic impacts on the landscape. They consume vegetation through grazing, they trample vegetation (which can facilitate the breakdown of plant carbon in the soil), and they transfer nutrients through defecation and urination. Targeted grazing uses all three impacts to accomplish specific vegetation management goals.

Targeted grazing contractors also have a solid understanding of the growth characteristics and vulnerabilities of specific target vegetation. For example, grazing yellow starthistle with sheep or goats during the bolt stage (April to June, usually), can dramatically reduce seed production. Browsing Himalayan blackberries in the fall as the plants are going dormant can stress root systems at a critical period.

Timing of targeted grazing for fuel reduction is also a critical consideration. To reduce the potential for regrowth, fuel reduction grazing should be done after the last spring rain. Since the nutritional quality of annual grasslands typically declines rapidly at this time of year, targeted grazers may need to provide supplemental nutrition to ensure both animal well-being and appropriate impact to targeted vegetation. In some instances, cattle may be the most appropriate species for particular projects.

Why should I pay someone to graze? Isn't free grass enough?!

Targeted grazing is a different business model than simply grazing for livestock production. Targeted grazing, as outlined above, focuses on impacting target vegetation at exactly the right time for specific goals. Grazing for livestock production, on the other hand, focuses on providing optimal nutrition to increase production (like number of lambs or pounds of gain, for example). Table 1 summarizes the differences between targeted grazing and more traditional livestock production businesses.

Table 1: Targeted Grazing versus Livestock Production

	Targeted Grazing	Sheep or Goat Production
Flock characteristics and species	• May be mixed species (sheep/goats) • Mixed age classes • May include older wethers (castrated males) to impact brush and coarser vegetation (because these animals are not used for reproduction, their maintenance nutrition requirements are often lower than reproducing females)	• Sheep or goats • Breeding flock + replacement females often grazed separately • Wethers are marketed to generate income
Primary income streams	• Grazing contracts	• Sale of lambs or kids • Sale of wool
Secondary income streams	• Sale of lambs/kids • Sale of wool	• Seasonal targeted grazing (usually while ewes/does are not lactating or pregnant)
Management emphasis	• Make animals available for grazing contracts • Maximizing days on paid contracts • High stock density to impact vegetation • May accept drop in body condition to facilitate desirable impacts to low quality vegetation	• Reproduction and lbs of lamb/kids marketed • Wool quality and lbs of wool marketed • May use high stock density to improve forage quality and production • Focus on body condition at specific production stages (pre-breeding, breeding and pre-lambing) • Requires irrigated pasture or other summer green forage
Reproduction	• Timed to allow maximum days on grazing contracts • Lower conception and weaning rates may be accepted in exchange for increased grazing income	• Timed to match peak demand (late gestation and lactation) with peak forage quality/quantity

Landowner Goals and Expectations

Realistic landowner goals are important for successful targeted grazing applications. Targeted grazing is often a long-term approach that addresses prior problems. For example, invasive weeds may be symptomatic of a long-term lack of management. A single targeted grazing project is unlikely to address these long-term symptoms; a multi-year approach will likely be necessary to improve ecological function and reduce the weed seedbank. Many targeted grazing contractors will reduce their annual per acre charges in exchange for multi-year contracts.

Expectations are also important. Landowners who expect a uniform appearance to land treated with grazing (as if the land had been mowed) will likely be disappointed; grazing often leaves a patchy appearance on the landscape. Furthermore, grazing does not often provide the immediate visual effects of chemical treatment. Vegetation treated with herbicide, for example, shows immediate impact; grazing is a long-term management technique.

Finally, grazing for fuel-load reduction modifies fuel profiles rather than eliminating all fuels. Grazed landscapes may still burn, but at a lower intensity than ungrazed landscapes.

Grazing Contractor Risks

Targeted grazing contractors assume a variety of risks. Variability in forage production (wet years typically produce a much greater volume of grass, for example) can make scheduling multiple contracts difficult. Toxic plants, whether naturalized, landscaped, or fed unintentionally by neighbors, pose risks to livestock health. Vandalism or theft of grazing equipment – and even livestock, in some cases – create financial and legal risks for contractors.

What to look for in a Targeted Grazing Contractor

Targeted grazing companies are essentially service providers. Consequently, experience, responsiveness and attention to detail are critical. Consumers should look for companies with experience in grazing projects in similar environments and situations. Ask potential contractors about their experience level – and ask for references.

How much does Targeted Grazing Cost?

Targeted grazing may not be the least costly vegetation management option (especially compared to mowing or herbicide treatment). As outlined above, targeted grazing is often the best alternative where other treatments aren't possible or are less desirable.

Most targeted grazing contractors will provide an estimate on a per acre basis, allowing consumers to compare targeted grazing to other vegetation management options. In addition, contractors will provide an estimate of the project start date and duration. These estimates can be somewhat uncertain depending on year-to-year changes in vegetation quantity.

There are a variety of factors that impact the cost of a particular targeted grazing project, including:

- Relative ease (or difficulty) of setting up infrastructure, including loading and unloading facilities. Projects in steep or difficult-to-access terrain require more labor (and, therefore, are typically more costly).

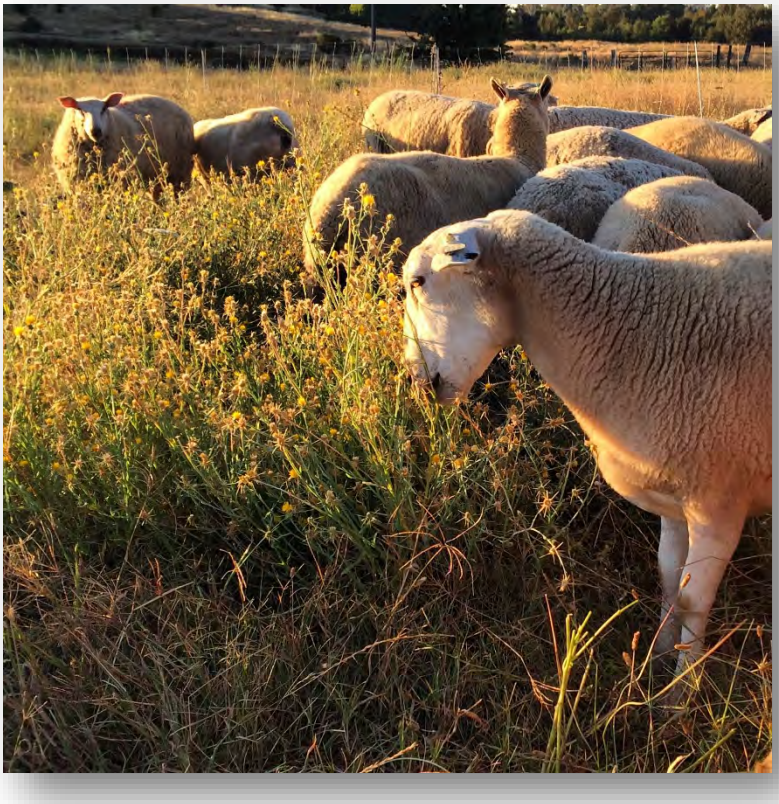
- Access to livestock water. Easily accessible water can make the project less costly; projects without access to water may require the contractor to haul water to the livestock.
- Other risks, like vandalism, toxic plants, or proximity to high-value landscaping may increase the cost.
- Multi-year contracts are typically cheaper on a per acre basis. Livestock and targeted grazing staff become more accustomed to a particular property (and therefore more efficient) if the contract is for multiple years.
- Headache factors – like free-roaming pet dogs or neighbors who object to livestock or livestock guardian dogs – can increase the cost of a project.

Scheduling

Landowners and managers should contact targeted grazing contractors well in advance of the desired project start date. Targeted grazing contractors are busiest during the spring and early summer months; scheduling these jobs typically occurs in the late fall and winter.

Further Reading

- Targeted Grazing Handbook (Launchbaugh and Walker 2006) - http://www.webpages.uidaho.edu/rx-grazing/Handbook.htm
- The Art and Science of Targeted Grazing – A Producer's Perspective (Macon 2014) - https://journals.uair.arizona.edu/index.php/rangelands/article/view/19702/19324



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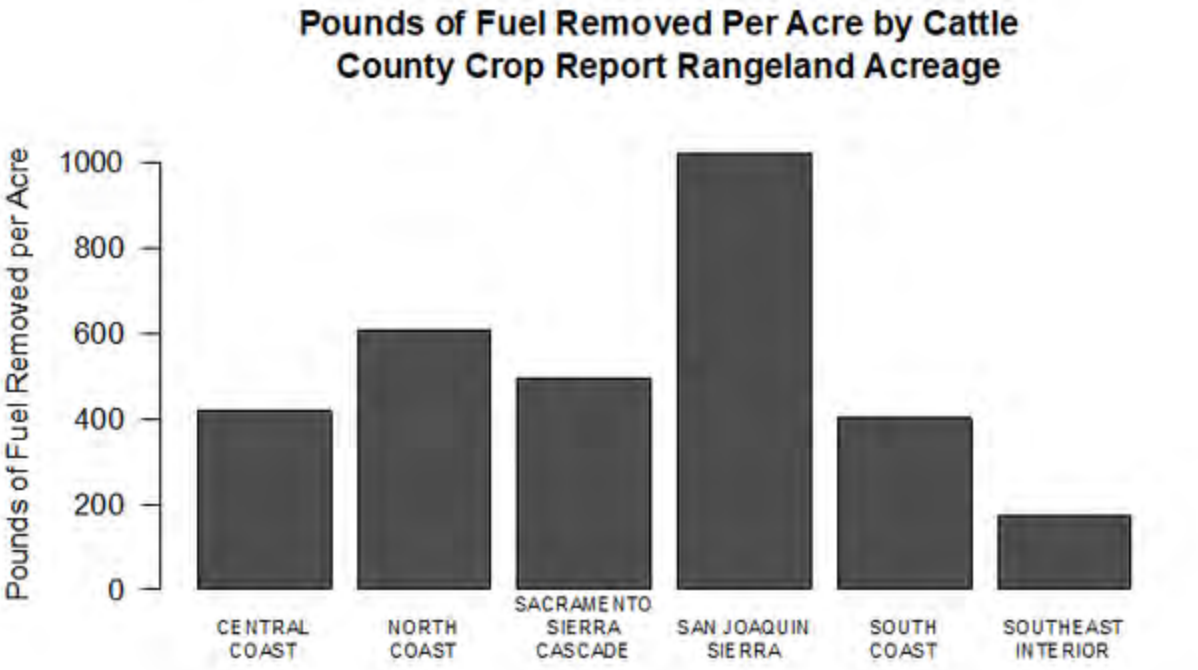
Benefits of cattle grazing for reducing fire fuels and hazard

September 11, 2020 Devii Rao

A timely study led by alums of the Bartolome-Huntsinger lab found that cattle grazing is an essential tool in reducing wildfire. The team included UC Cooperative Advisors Devii Rao, Sheila Barry, Matthew Shapero, Larry Forero, and Berkeley Extension Specialist Luke Macaulay, all with Berkeley degrees, along with three other authors. Alum Felix Ratcliff is first author, and Devii Rao coordinated the project. Contributor Rowan Peterson is a former student of Environmental Science, Policy, and Management professor Lynn Huntsinger. The following article was originally published in the University of California Agricultural & Natural Resources blog.

The widespread and severe wildfires in California during the past several years highlight the importance of understanding how land management practices such as cattle grazing affect wildfire risk. The California Cattle Council recently funded a UC Cooperative Extension project to evaluate how much fine fuel (grasses and other plants) are eaten by cattle on rangelands, and how this may affect wildfire behavior. These results have not yet been published, but preliminary results are presented here.



Cattle Numbers

The study found that about 1.8 million beef cattle grazed California's rangelands, which include grasslands, oak woodlands, and brushland or scrubland, in 2017.

Beef cows were by far the most abundant beef cattle class, with 677,000 on range in the state. This was followed by steers, heifers, and bulls.

Fuel Removal by Cattle

Beef cattle are found grazing in every county in California, except San Francisco and they consumed 11.6 billion pounds of fuel in 2017. Our analysis which was based on county crop reports, Agricultural Census data, and UC Cooperative Extension data showed that cattle consumed vegetation across about 19.4 million acres of rangeland, primarily privately-owned. However, some grazing also occurs on federally-owned and other public lands too, especially in the mountain and desert regions of the state.

The amount of fuel consumed per acre varied greatly based on region (Figure 1). The average amount of fuel removed across grazed rangelands in the state was 596 pounds per acre. This number varied from 174 pounds per acre in the southeast interior region to 1020 pounds per acre in the San Joaquin-Sierra Region (Figure 2). Fine fuel reduction on any given ranch can differ greatly (either higher or lower) from the region-wide estimates in this study. Figures 3, 4, and 5 show examples of 500, 1,200, and 3000 lbs./acre of grassland vegetation.

These fuel removal estimates are based on the best available data, but this data does not describe the complex details and variation of cattle grazing across the state. There is a need for more consistent and accurate accounting of cattle numbers and grazed acres across the state to better understand grazing's impact on fire fuels.

These regional values of fuel removal are much lower than the amount of vegetation or forage that grows naturally in these regions in most years. Valley grasslands in the interior of the state generally produce 2000 pounds of forage per acre or more in an average year (Becchetti et al. 2016, Bartolome 1987). Coast range grassland sites in central and northern California generally produce more than 3000 pounds of forage per acre (Larsen et al. 2020, Becchetti et al. 2016). Coastal prairie sites can be highly productive, producing more than 4500 pounds per acre on average in the central coast (Larsen et al. 2020). The highest production years can see double the average production in any given region, and

the lowest production years can be less than 25% of average production. The relatively low amounts of fuel removal reflect conservative stocking strategies, which are used by many ranchers across the state as a way to guard against drought and the unpredictable nature of forage production (Macon et al. 2016).

Influence of Cattle Grazing on Wildfire Behavior

Maintaining flame lengths below four feet is often cited as a critical threshold that allows fire fighters to safely access an area from the ground without heavy equipment (Andrews and Rothermel 1982). Fire behavior models developed for this study suggest that maintaining fine fuels at or below 1200-1300 pounds per acre during spring and summer will keep flame lengths below four at wind speeds up to 40 mph. This number is affected by other factors however, and during very dry weather conditions, fine fuels may need to be kept at or below 800 pounds per acre to keep flame lengths below 4 feet. These numbers are useful for interpreting the impacts of reducing fuel levels, but they still need to be experimentally validated in California.

In addition to reducing fine fuels, cattle grazing can also reduce rangeland fuels by preventing or slowing encroachment of brush and trees onto grasslands. This is valuable from a fire safety perspective because brush can increase fire hazard and fire intensity (Ford and Hayes 2007, Parker et al. 2016).

Reducing fire hazard is not as simple as grazing rangelands to bare soil or even to low level of fuel. Rangeland managers need to balance different management goals. They aim to leave some forage on rangelands at the end of the grazing season (before the first fall rains) to protect soil from erosion, support future forage production, avoid growing some types of weeds, and often provide fall forage for their cattle. In some areas, it is important to leave more than 1200-1300 pounds of forage per acre to achieve these goals, so reducing fuel loads

will have to be done carefully to avoid conflicts with other management targets (Bartolome et al. 2006).

Conclusions

Cattle grazing plays an important role in reducing fine fuels on grazed rangelands in California. Without grazing we would have hundreds to thousands of additional of pounds/acre of fine fuels on the landscape, potentially leading to larger and more severe fires. The bulk of this fuel reduction occurs in regions of the state with higher forage production per acre. Therefore, while average fuel reduction rates are higher in these regions, residual fuels may not be low enough across all grazed rangelands (even in regions with high fuel reduction rates) to avoid long flame lengths. Fortunately, cattle do not generally consume forage uniformly at the field, ranch, or region scale. At many locations within grazed rangelands, there will likely be patches that are grazed low enough to significantly alter fire behavior, and patchy fuels can slow fire extent and rate of spread.

Widespread and severe wildfires are predicted to increase over time in California. This “new reality” requires that we take advantage of all the tools in our management toolbox to protect public safety while meeting our broader rangeland management objectives. Grazing all rangelands to ideal fuel levels is not logistically feasible or compatible with management goals. However, there are opportunities to improve fire safety in California by grazing rangelands that are not currently being grazed or even by increasing grazing intensity on very lightly grazed areas. The number of beef cows in California today are only about 57% of their peak numbers in the 1980s (CDFA 2010-2018). This reduction is mirrored by declines in public lands grazing. Strategic implementation of cattle grazing, including potentially fee-for-service agreements, on key private and public lands can meet multiple natural resource objectives, while also lowering fire hazard through reducing fine fuels, reducing fuel continuity, and slowing or stopping brush encroachment into grasslands.

This research was funded by the California Cattle Council.

UC ANR advisors support cattle ranchers after wildfires

A free hay program was started after the Thomas fire, closed highways were opened for ranchers after the Camp fire, and UC research helped answer ranchers' questions about pasture recovery.

Matthew Shapero

The morning after the first day of the Thomas fire in Ventura County, around 60,000 acres of ranchland in commercial production had been burned. The first task ranchers faced was to locate cattle and find a secure place for them. Then a decision had to be made to buy hay for the winter or cull the herd.

After the Camp and Thomas wildfires, ranchers who had lost the annual dry grasses in the pastures that were to feed the cattle through the winter had three urgent questions. The first was an existential question — should they cull their herd. The other two concerned pasture recovery — how soon could they return cattle to burned pasture, and would the annual grasses come back well or would invasive weeds such as starthistle overwhelm the forage grasses.

UC ANR Cooperative Extension (UCCE) livestock advisors moved quickly to help ranchers after the 2018 Camp fire in Butte County and the Thomas fire in Ventura County in 2017. For example, 5 days' worth of hay was quickly provided to Ventura County ranchers to allow them a little time to strategize about what to do with their animals, and access to closed highways was negotiated for Butte County ranchers trying to move cattle. Advisors pitched all their skills and influence to provide emergency relief to affected ranchers, many of whom they knew personally. And they turned to UC research to answer the big questions.

The Camp fire occurred as ranchers in Butte County were preparing to move their cattle down from the Sierra summer pastures to the winter pastures around Paradise. In case firefighters came across cattle that had been moved there already, Butte County UCCE livestock advisor Tracy Schohr immediately put together a plan for their evacuation and transport out of the area.

Around 35,000 acres of cattle-grazing land burned in the Camp fire, and hundreds of miles of fences were destroyed, as was infrastructure such as irrigation and buildings. Ranchers had been used to a periodic fire in June or July, which gave them time to mend fences and make other repairs before the winter migration. After the November Camp fire, ranchers had to make quick decisions about where to overwinter their cattle.

Some culled their herd, some had neighbors, or friends, who could take their cattle for the winter. Some were trying to winter cattle in the summer pastures if they didn't flood. The economics of buying hay for the winter were challenging; after the fire, hay prices went up. Ranchers turned to Schohr to ask if it was safe to move their cattle to pastures near Paradise.

Camp fire ash and water testing

Schohr and Betsy Karle, the area dairy advisor, used a UC ANR opportunity grant, designed for time-sensitive critical research, to assess whether it was safe for cattle to be moved onto pasture that was not burned but had received ash from the fire. They took samples of ash-covered forage from four Butte County ranches and sent them to a lab for toxicology testing. Results showed that metal concentrations were unremarkable.

Online: https://doi.org/10.3733/ca.2019a0004

Betsy Karle, UCCE Glenn County director and area dairy advisor, takes a forage sample from a ranch in Butte County. Karle and Schohr secured a UC ANR opportunity grant to assess whether it was safe for cattle to be moved onto pasture that was not burned but had received ash from the fire.

Tracy Schohr, UCCE Butte County livestock advisor, took weekly water samples from the Feather River to check for heavy metals, which are very toxic to cattle. Paradise is at the top of the watershed that supplies water to ranchers.

Schohr took weekly water samples from streams in the Camp fire watershed from late November through early spring to test for the presence of heavy metals. "Nineteen thousand structures burned in the Camp fire. It was essentially an urban fire, and we don't know what contaminants could have ended up in the water," says Schohr. "The issue is a big one because Paradise is at the top of the watershed that supplies the ranchers water," she says. So far, no test results have suggested any reason for concern about heavy metals being present in the source of livestock drinking water.

Weed and forage recovery

Schohr advised ranchers that the fire would not have killed weed seeds, based on the research of Josh Davy, Tehama County livestock, range and pasture advisor and UCCE county director. Fires crossing dry pasture "move so quickly they do not produce enough soil surface heat to kill weed seeds that have fallen to the soil surface," says Davy. If the Camp fire had occurred earlier in the year, the situation may have been different: "A spring burn, while seeds are still on the plant, is very successful at controlling weeds because they are burned in the spikelet," he says. To achieve some control of returning medusahead and starthistle, Schohr recommended that burned pastures should be grazed this spring in March-April and April-June, respectively.

Davy's research suggests forage production will be greatly reduced this year on the burned pastures. In a 3-year comparison study on burned and unburned winter annual rangeland plots in Tehama County, Davy found substantial forage losses in the 2 years following the burn. "Production in the burn treatment was half that of the area not burned the following year and 79% the second year" (Davy and Dykier 2017).

Destocking, seeding options

The toughest question ranchers had after the Camp fire, and also the Thomas fire, was whether they should sell their livestock. Though Schohr and Matthew Shapero, livestock and range advisor for Ventura and Santa Barbara counties, held meetings with ranchers on how to quickly apply for compensation with the U.S. Department of Agriculture Farm Service Agency and Natural Resources Conservation Service, any payments are usually slow to arrive. "For many ranchers, it's a real financial burden; they are on their own economically," says Shapero.

Within the first few hours of the Thomas fire, around 60,000 acres of ranches in commercial production burned. As they located missing livestock, ranchers had to find secure locations for them and decide if they were going to buy feed for the winter or destock. "Ranchers in Ventura County had just emerged from a devastating drought that had forced many of them to sell off livestock, so to sell more seemed an existential threat," says Shapero.

One option was to seed burned pasture. It would seem there would be an obvious benefit to that, but Shapero's advice was that seeding was an expensive proposition with uncertain outcomes: rains could fail and result in poor germination; birds and rodents are drawn to seeded pastures and feed on the seed; and, if rains are too heavy, seed can wash out of the soil — it's

Five weeks after the Camp fire started, new grass was growing on burned land. The fire left patches of unburned land (background); ranchers asked UC advisors whether it was safe to move cattle into pasture covered with ash.

After the Thomas fire, grasslands burned at low severity, *top*, showed incomplete combustion and grasses were still largely present; but shrubland burned at high intensity, *bottom*, showed no biomass and a crusted soil surface.

Seeding may be advantageous on badly burned land. In January 2018, 1,000 acres on this Ventura County ranch were aerially seeded with 10,000 pounds of cereal rye in 1 day.

Matthew Shapero, UCCE livestock and range advisor for Ventura and Santa Barbara counties, arranged for ranchers affected by the Thomas fire to receive 5 days' worth of free hay. Unknown at the time was how soon the grasslands would recover. UC studies in Tehama County showed markedly reduced pasture production in the 2 years after a burn.

especially difficult to achieve good seed-soil contact on burned ground. Furthermore, seeding areas with non-native forage species can be a concern for the recovery of native shrub and herbaceous species.

Research was lacking on whether seeding might be a good choice on severely burned land, where forage recovery would likely be most delayed. Shapero decided to test the viability of the forage grass seedbank in plots of unburned and burned land. On five ranches, he collected a total of 150 soil core samples from grass and shrubland areas that had experienced no burn, low-severity burn or high-severity burn and potted them up in a greenhouse and watered them, noting seed germination date and rates and function group — grass, forb or shrub. Results indicated that there was no statistically significant difference in number of forage grass seedlings between no- and low-burn soil samples, but there was a significant visual difference in the number of seedlings in the high-burn soil samples. These results suggested that ranchers interested in seeding to increase post-fire forage production should target areas that experienced high-severity burning.

Davy also believes seeding could be of value in areas where fire has burned hottest, which would not usually be open grasslands, he says, but in areas with woody material. Davy has researched the best options for forage selections in Northern California foothill rangelands, in terms of their establishment and survivability over time. Of 22 diverse forages, annual ryegrass and soft brome performed well in the short term and Flecha tall fescue, several hardinggrass varieties and Berber orchardgrass worked well in the long term (Davy et al. 2017).

Post-fire grazing

One of the common questions ranchers ask after a wildfire is what effect bringing cattle back on to the land will have on forage production in the coming season. In December 2017, Shapero was awarded a UC ANR opportunity grant to research that. He placed 70 exclusion cages around 1-meter plots on the ranches to monitor post-wildfire recovery of burned land that was grazed compared to land (inside the cages) that was not. He removed the cages in May 2018 and is monitoring forage production and species composition for the next 3 to 5 years.

In December, the burned pastures around Paradise quickly produced new growth, and rains and warm temperatures in January sustained that growth. Many ranchers were letting the land rest a few months while paying for hay, but watching the land green up just weeks after the worst fire they had ever seen provided hope that recovery was underway. CA

— H. White

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