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University of California Cooperative Extension - Siskiyou County

2021 Summer Newsletter

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The Siskiyou UCCE Office's hearts go out to those struggling to deal with drought, COVID, and fires. Over the last few months we've had requests from multiple stakeholders about strategies for dealing with drought and limited water. It has also been announced that the California Regional Water Quality Control Board North Coast Region adopted the emergency curtailment of surface water and groundwater use for agriculture. According to these regulations, the intention of the agencies involved is to prevent water diversion that would negatively affect the fall-run Chinook and Coho salmon species and guarantee minimum flows in the Scott and Shasta Rivers. These minimum flows, measured in cubic feet per second (cfs) at the northern end of Scott Valley (Scott River) and near Yreka (Shasta River), are as follow:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Scott River	200	200	200	150	150	125	50	30	33	40	60	150
Shasta River	135	135	135	70	50	50	50	50	50	125	150	150

*The current flows can be checked at:

Scott River- https://waterdata.usgs.gov/ca/nwis/uv?site_no=11519500
Shasta River-https://waterdata.usgs.gov/nwis/uv?cb_00060=on&cb_00065=on&format=gif_stats&period=30&site_no=11517500

The curtailment regulation differs for the Scott and Shasta river watersheds. For Scott River the proposal provides at least a "net reduction of water use of 30% throughout the irrigation season (April 1 – October 31) as compared to the previous irrigation season, and a monthly reduction of 30% in the July 1 to October 31 time period, as compared to the prior year. For Shasta River, the proposed net reduction of water use is 15% throughout the irrigation season (March 1 – November 1), as compared to the prior irrigation season, and a monthly reduction of 15% in the June 1 through September 30 time period, as compared to the prior year. Please note that indoor domestic use, energy sources, fire prevention, public health efforts, reforestation operations, and non-consumptive water use are exempt from these regulations. In addition, there is a minimum diversion allowed for livestock watering.

If you want to receive drought-related notices and updates about the curtailment in the Scott River and Shasta River watersheds, consider subscribing to the California Water Boards email subscription list at https://www.waterboards.ca.gov/drought/scott_shasta_rivers/ (bottom of the page).

This newsletter focuses on strategies for maximizing water use efficiency with subsequent newsletters focusing on exploring the topic of 'maximizing forage production during drought' further. We hope that the information provided is useful to growers during such challenging times.

How to cope with the drought?

From your advisors Giuliano Galdi, Grace Woodmansee, and Rob Wilson

Tips for maximizing water use efficiency

1. Check your irrigation system periodically

Irrigation efficiency and uniformity depend on well-maintained irrigation systems. Leaks, mismatched sprinkler heads, and improper sized piping have adverse effects on the system pressure, which negatively affects the system's flow rate leading to wasted water and low crop yields. Fine tuning wheel lines and center pivots helps save water and increase crop yields. Avoid irrigating paved roads and non-crop areas. This wastes water and paints a bad picture of agriculture water use.

Figure 1. Alfalfa roots at IREC.

2. Soil moisture and Evapotranspiration (ET)

All producers need to know their crop water requirements and how much water their soil can hold. Apply the correct amount of water when the crop needs it. Deep rooted crops such as alfalfa have an extensive root system and can get water from the soil as deep as 8 ft. Deep rooted crops often require more water per irrigation to refill the soil profile, but they require less frequent irrigation as the deep roots can use water deep in the profile during the hottest months of the year. **Figure 1 and 2** show a pit dug in an alfalfa field at IREC. In this case, alfalfa roots were found at 6 ft deep (as deep as the backhoe could dig). Shallow rooted crops such as grass hay and vegetables require less water per application, but their shallow roots require more frequent irrigation events. Soil moisture should be checked at least once a week for all crops with shovels, soil probes, or soil moisture sensors to make sure the crop is being water according to crop need. Every inch of water counts and proper scheduling often makes the difference between success and failure.

Figure 2. Alfalfa roots were found at 6 ft. deep and rhizobium nodules at 3 ft.

3. Prioritize most productive fields

When water is scarce, consider consolidating the available water on high yielding fields leaving fields with historic low productivity or fields with hardpans, compaction, or poor stands dry. Allocating water wisely increases water use efficiency (crop produced by unit of water). For fields with poor yields, determine the cause of the problem. Is the problem poor drainage, lack of water, overwatering, pests? Consider drought tolerant crops that can provide satisfactory yields when irrigated early in the season while surviving deficit and/or no irrigation for the remaining of the season in fields that normally go dry every summer.

4. Know when to apply the limited water supply

When dealing with the uncertainties of water supply, it's important to allocate available water to crops when yields and economic returns are greatest. For alfalfa, the ideal timing is to fully irrigate the crop before first cutting and hopefully second cutting. For irrigated pastures, it is important to irrigate fully in spring and early summer when temperatures are favorable for grass growth. Not watering alfalfa and grass crops in the spring to save water for late summer irrigation is not a good idea. In this situation, the producer does not maximize yield when crop growth is greatest and irrigating in late summer when the crop is already drought stressed produces much less forage compared to fully irrigating in the spring. Please keep in mind, overirrigating in spring also has a negative impact on crop growth as plants need oxygen exchange within the root system

Should alfalfa be irrigated after it goes dormant?

The vast majority of alfalfa fields do not benefit from irrigating in the fall after the last cutting. Even in specific cases where the fields are grazed or stressed, the cost of irrigation water is not justified. The reason behind it is that alfalfa varieties we grow in Siskiyou County have very slow growth rates after the last cutting. Once we have a hard frost (mid-20's), crop growth ceases almost completely. Alfalfa can also go dormant due to

Online resources

UCCE irrigation guides can be found here:
https://anrcatalog.ucanr.edu/Items.aspx?hierId=4000

UC Rangelands Drought Hub:

https://rangelands.ucdavis.edu/drought/

Do you want a hard copy?

Call or stop by the extension office- if we don't have the resource you need, we can help you find it.

the lack of water (drought induced dormancy). In this situation, it's tempting for growers to irrigate alfalfa to refill the soil profile or recharge groundwater for next year. However, irrigating drought stressed alfalfa after dormancy has not been shown to increase winter survival and it is not recommended as excess surface water and precipitation are not available.

In the Intermountain Region of California, the moisture needed to refill the soil profile for spring crop growth is generally provided by winter rains. If winter precipitation does not refill the soil profile, growers are best suited to refill the soil profile with irrigation in the spring when water is most abundant. While some growers might be worried about subsequent year's production following drought, many deficit irrigation studies conducted throughout California show the same level of yield is achieved in the following year, even when irrigation water was cut off early in the season. In addition to not helping with alfalfa winter survival, irrigating after last cutting can stimulate winter annual weed germination.

What about irrigating grass pastures in fall?

Grasses have shallower root systems than alfalfa and many grasses stop growing when water is cutoff mid-season. Although it may be tempting to irrigate dry pastures after killing frosts, the increase in grass growth is typically minimal and not economical. A study conducted by Steve Orloff in Scott Valley showed no difference in fall grass growth between ceasing irrigation on September 20th versus October 5th on pastures grazed on October 20th. On top of that, pumping charges and labor costs should be considered before deciding to apply water late in the year. For more information, please review the UCCE publication ***Managing Irrigated Pasture during Drought at:***

https://alfalfa.ucdavis.edu/subpages/Irrigation/IrrigationBrochure.pdf

Evaluating soil moisture in irrigated pasture

The inherent complexity of irrigated pasture systems makes monitoring soil moisture challenging as it is rare to have a uniform soil, slope, and grass species component throughout grazed pasture. For those interested in establishing monitoring points, the first step is to understand your site characteristics, such as use, soil type, topography (e.g., slope and aspect) and irrigation type. Considering all these characteristics, producers then select one or two monitoring points in a pasture that are representative of the entire pasture, with the goal of selecting monitoring points that capture as much of the diversity of your pasture as possible so that management decisions are informed.

- For detailed information about monitoring, please see the UCCE publication ***Soil Moisture Monitoring: A Simple Method to Improve Alfalfa and Pasture Irrigation Management at*** https://anrcatalog.ucanr.edu/pdf/8537.pdf

Maximizing forage production during drought

Irrigated Grass Pastures: Maximum forage production and water use efficiency usually occurs in spring and early summer. As such, allocating water to fully irrigate grass pasture and alfalfa from April through June is a good idea. As alfalfa is deep-rooted and capable of surviving drought better than most grass species such as orchardgrass and tall fescue, summer water should be prioritized for application on healthy, grass pastures to maximize grass survival. The specie of grass and its ability to go dormant under drought stress also dictates the best approach to allocating water across the farm.. While wheatgrass can survive summer drought, one or two irrigations in mid-summer can make a difference between stand loss and plant survival in orchardgrass pastures. Additional information about grass options grown in the County are discussed below:

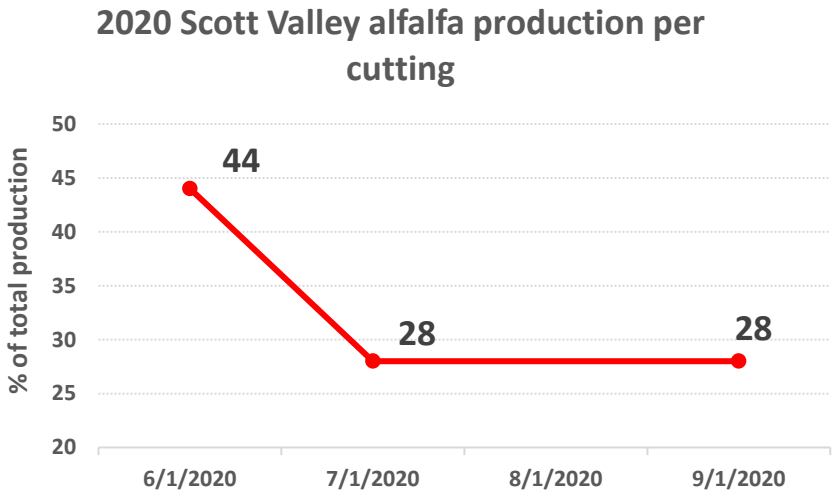
Tall fescue yield is reduced more than brome or wheatgrass under deficit irrigation. However, since tall fescue is much more productive under full irrigation, tall fescue's net yield under deficit irrigation is still greater than most grasses. That's why it is considered the best specie for irrigated perennial pasture in the intermountain region. Summer dormant tall fescue varieties such as Flecha and Prosper are not as productive as the summer active varieties when water is available but summer dormant tall fescue varieties have superior performance under drought conditions. Producers may want to consider planting summer dormant varieties for irrigated pastures that regularly dry down during summer in drought years.

Smooth brome, meadow brome, and wheatgrasses don't generally perform well under full irrigation. However, they are great options for pastures with limited water after June and dryland conditions (as long as precipitation meets the crop water requirement).

Orchardgrass, Timothy, and Ryegrass are high yielding species that produce high quality hay with adequate irrigation. However, they are not drought tolerant and the stand can be damaged when not fully irrigated.

Alfalfa growers have three major choices to deal with drought and possible irrigation water curtailments - reduce crop acreage (triage), partial irrigation during the season (starvation diet), and full irrigation during the spring and early summer and then stop irrigating in summer and fall (cold turkey). One thing to keep in mind: yields will be negatively impacted in all cases.

During drought years, a longer interval between cuttings (go for yield not dairy quality) will maximize yield and can often help mitigate economic losses as hay prices are often high and fewer cuttings maximize yield while reducing harvest costs. In extreme drought situations, producers should grow as much hay as possible in the first two cuttings then turn off irrigation by the end of July. In a 3-cut schedule, the first two cuttings correspond to 72% **(figure 3)** of the season total production. Since crop water use is highest in the summer, the applied water efficiency (yield per unit of water) is greater in spring, which is another reason to prioritize the first cuttings.



Irrigation Efficiency

Center Pivot irrigation has increased water application efficiency greatly here in Siskiyou County. Surface irrigation systems (flood, furrow, and basin) systems have an average 60% application efficiency, which means that about 40% of the water applied is not used by the crop. On the other hand, center pivots irrigation uniformity varies from 78% of MESA (Mid-elevation Spray Application) to 95% of LEPA (Low Energy Precision

Irrigation). The intermediary system LESA (Low-elevation Spray Application) provides 88% of irrigation uniformity on average. Besides saving water, LEPA and LESA require lower operating pressure. While MESA requires 40 psi to operate, LEPA and LESA work with just 15 psi. These low-pressure systems allow producers to spread flow rates over a larger area and save money by reducing pumping costs as higher operating pressure (PSI) requires more energy.

Giuliano Galdi is currently conducting a pilot project to compare MESA and LEPA irrigation systems. The results will be shared with you once all data is collected and analyzed. He hopes to get some funds to further investigate this matter in the near future.

Alternative Crop

Giuliano has been brainstorming this one for a while. Alfalfa is one of the best crops with regards to water use efficiency – deep root system, almost all above ground biomass is harvested, and it has the ability to go dormant for long periods per year. However, alfalfa is a perennial crop that requires 35 (Scott Valley) to 38 inches (Tulelake) of water to avoid drought stress.

Winter small grains grown for hay are an excellent option to produce high quality hay while saving water from July to September. Typically winter small grains need one irrigation to bring the crop up when planted in fall. This first irrigation can be done before or right after planting – the timing depends on the water available in the soil and the amount of precipitation predicted after planting. Data show that seasonal water consumption by wheat or triticale in the Central Valley is generally lower than 10 inches when the crop is harvested for forage. After the crop's establishment, winter precipitation or a couple irrigations are needed produce a winter grain hay crop. Spring irrigation should occur from the tillering to boot stage according to soil moisture monitoring.

Finding alternative crops, especially with high tolerance to drought or lower water requirement, is part of our research program. As new water related challenges arise, we must be prepared to guarantee a high-yielding and sustainable agriculture in our County. Please let us know if you have any suggestions regarding alternative crops or questions about drought related issues.

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- How to cope with the drought?
- Should alfalfa be irrigated after it goes dormant?
- What about irrigation grass pastures in fall?
- Maximizing forage production during drought
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