Managing Water Quality on Irrigated Pasture

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Introduction

Irrigated pasture is a critical component of most commercial grazing operations in the Sierra foothills and Sacramento Valley. Pasture provides nutritious forage at a time of year when the nutritional quality of rangeland forage is declining. Irrigated pasture can also provide important additional benefits, like wildlife habitat and groundwater recharge. On the other hand, improperly managed irrigated pasture can be a potential source of pathogens, nutrients, sediment, and other pollutants. Commercial producers who irrigate pastures in the 4-county region are subject to water quality regulation under the Irrigated Lands Regulatory Program (ILRP) administered by the Central Valley Regional Water Quality Control Board (CV Board). This publication outlines management practices that can protect or enhance water quality while improving pasture productivity.

"Source" Pasture Characteristics

Research regarding irrigated pasture management in the Sierra foothills, Sacramento Valley, and Sierra Nevada indicates that pastures that are a source of water pollution have similar characteristics. These pastures tend to have high stocking rates and generate high runoff rates. They may be grazed during irrigation, discharge tailwater to low-flow streams, and allow livestock direct access to these streams. Most of the management solutions outlined below address these specific conditions. These solutions also improve forage quality – in other words, good management benefits both water quality and livestock production!

Moderate Stocking Rate

A number of factors influence the daily forage intake of grazing livestock, including animal species, animal weight, forage quality, and animal stage of production (e.g., gestation, lactation, etc.). On high quality forage (e.g., spring grass or irrigated pasture), a lactating female (cow, ewe, doe) will consume about 2.3% to 2.5% of her body weight each day on a dry matter basis. A non-lactating female will consume 2.0% to 2.1% of her body weight.

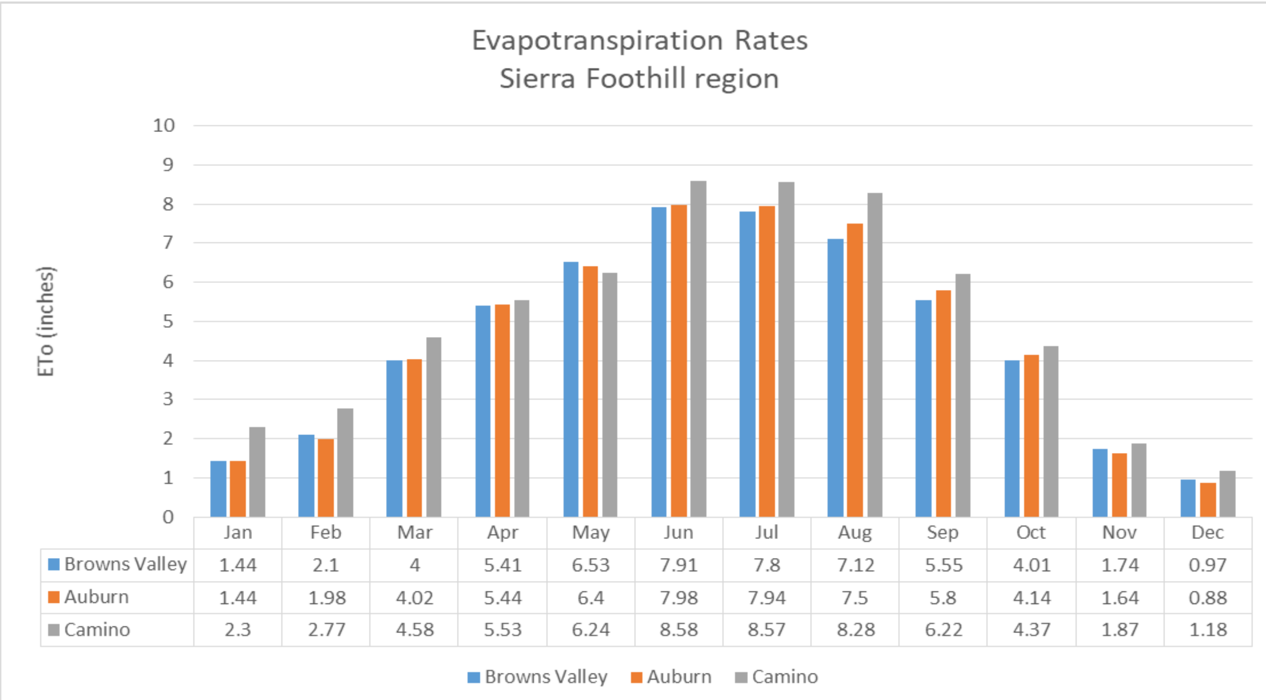
A rule of thumb on foothill and valley rangelands is to stock irrigated pasture at 1 animal unit (1 cow, 5 ewes or 6 does) per acre of pasture. This stocking rate should vary according to pasture productivity, animal size, stage of production (lactating, gestating, dry), and growth rate of the pasture.

Use Rotational Grazing

From the standpoint of protecting water quality, rotational grazing can allow producers to move livestock off of pastures during irrigation. By not actively grazing a pasture as it is being irrigated, we can reduce the likelihood of pathogen contamination in tailwater. This can also reduce livestock health problems – especially foot rot and respiratory infections in young animals. Some soils may be compacted if they are grazed while saturated; a rotational system may help reduce compaction problems. Finally, a well-managed rotational system can allow rest periods to vary to accommodate variations in pasture recovery rates, which can improve forage productivity and quality.

Irrigation Design and Scheduling

Irrigation water demand is driven by evapotranspiration rates (ETo). ETo refers to the amount of water lost through evaporation or through plant transpiration. The graph below generally depicts typical ETo in the Sierra Foothill Region. Obviously, actual ETo depends on real-time climate and weather factors (including air temperature, wind, and humidity). Effective irrigation replaces the water lost to ETo. Note that in June and July, a pasture in Auburn would need the equivalent of 8 inches of rainfall (through irrigation) to meet soil and plant demand.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Browns Valley	1.44	2.1	4	5.41	6.53	7.91	7.8	7.12	5.55	4.01	1.74	0.97
Auburn	1.44	1.98	4.02	5.44	6.4	7.98	7.94	7.5	5.8	4.14	1.64	0.88
Camino	2.3	2.77	4.58	5.53	6.24	8.58	8.57	8.28	6.22	4.37	1.87	1.18

Irrigation systems should be designed to provide the amount of water needed for pasture growth, based on site-specific conditions and soil characteristics. When possible, irrigation sets and rotations should be varied to reflect seasonal changes in ETo. The California Irrigation Management Information System (CIMIS - https://cimis.water.ca.gov/) provides regional real-time ETo data.

Tailwater systems are also an important component of irrigation system design, particularly in flood irrigation systems. Tailwater systems should be well-vegetated to trap sediments and pathogens. The Natural Resources Conservation Service (NRCS) can provide assistance in designing systems.

Proper system design and management will reduce runoff and protect water quality; applying irrigation water according to plant demands will also improve forage quality.

Vegetative Buffer Strips

A vegetative buffer strip at the end of a pasture can filter runoff before it enters a tailwater capture system. These strips can filter pathogens and allow for nutrient update by vegetation (which reduces nutrient loads in tailwater). Effectiveness is greatly diminished under high runoff rates, however, as transport energy is too great. In addition, vegetation in these buffer strips must be managed to maintain effective filtration.

Supporting Research:

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