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Water Quality Update – Survey of Irrigated Pastures and Meadows

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Water is the lifeblood of irrigated pastures and meadows that provide critical green forage during the summer months. While the water applied is what provides the basis for pasture production, it is the water that runs-off irrigated lands that is the focus of State and Regional Water Quality Boards and their staff.

UC researchers have collected water samples from many cooperating ranches with irrigated pasture and mountain meadow systems from Modoc to Stanislaus Counties. Sampling was conducted above and below these pasture systems throughout the irrigation season and replicated for statistical analysis. Size of the pastures sampled varied from 35 to over 600 acres. A number of water quality constituents including sediment, nutrients, and *E.coli* bacteria were recorded.

Sediment, typically associated with soil erosion, is considered non-point source pollution when excessive fine sediments are suspended or dissolved in water. Sediment in streams is usually measured as Total Suspended Solids, Turbidity, and Dissolved Organic Carbon. Highly turbid water can be damaging to aquatic habitat and site feeding fish such as trout. High loads of sediment are sometimes linked to nutrients, bacteria, and aesthetics. Among the pastures surveyed there was little to no increase in sediments in samples taken upstream or down stream of the pastures.

Nutrients in water such as nitrogen (N) and phosphorous (P) can be derived from applied fertilizer, manure from livestock, sediment or natural nutrient cycling associated with grassland communities. Excess N and P are related to algal blooms, which can be toxic to fish and other aquatic species as well as causing unsightly green water.

Nutrient data collected in this study indicated very low levels; often below the detection limits of the lab. Valley systems that receive ditch water from other users tended to be sinks for nutrients. N and P were used for forage production. This data indicated that, at least in the pastures sampled, very few pastures showed a problem with nutrient levels.

Bacterial contamination is often measured by counting coliform bacteria (Total Coliforms) of which *E.coli* is a specific coliform and comprises a small part of the larger Total Coliforms. Water quality standards are set for Total Coliforms. Only a small portion of the *E.coli* family (the pathogenic ones such as O157:H7) are the coliforms that can make people sick (pathogenic). These standards vary based upon the intended use of the water (drinking, contact recreation, etc.). Coliforms are shed by all warm blooded mammals and may multiply by growth in feces as well as decaying plant material. Environmental factors such as heat, and drying will also kill coliforms.

The *E.coli* story is more complicated. Some pasture systems did show more *E.coli* downstream of the pasture/ meadow than above it. In contrast, several pasture systems seem to function as a filter, removing *E.coli* that was present in the water upstream of the ranch. Out of 10 pasture systems surveyed in northeastern California, three showed a marked reduction in *E.coli* downstream of the pasture, four showed little change, while three had higher *E.coli* levels downstream.

The amount of runoff and how much fresh manure is on the pasture during irrigation may be key factors. Fresh manure is a source of *E.coli*. Irrigation water running across fresh manure has enough energy to carry even tiny particles off the field and into a stream or ditch. The opportunity for downstream *E.coli* contribution exists. Where little tail water escape occurs or where it percolates, the opportunity to move *E.coli* is much lower. Similarly, after the manure on the pasture is more than a few days old, much of the *E.coli* has perished, so viable *E. coli* would not be transported by runoff. Scheduling irrigation 3 or 4 days after cows have left the field may be a simple solution to reduce *E. coli* pollution, in some cases.

Warm productive environments of the foothills and valley may be more conducive to high counts of E. *coli*. Surveyed streams from valley regions had much higher E. *coli* in the tail water compared to mountain regions. However, we are still reviewing the data from these sites compared to meadow systems. While concentrations were higher in the Valley systems, typically there was less flow since runoff was being collected directly at the bottom of the field, while meadow systems runoff was being collected down stream of the meadow. This is important to consider since the amount of runoff may be small from the meadow, but entering a bigger water body may be giving a dilution

effect. Another big difference between the valley and meadow systems is where the runoff ends up. Many ranches recover their tailwater and runoff does not leave the property.

The *E. coli* water quality constituent should be carefully considered. The standards used by Regional Water Quality Boards for *E. coli* or fecal coliform vary, and in many cases are easily exceeded. Sources of coliforms are ubiquitous. When cattle are a source of coliforms, there appears to be relatively straight-forward management alternatives for those who do need to reduce downstream pollution. These include:

- Allowing the pasture to rest for a few days provides a kill step, reducing the amount of viable *E.coli* available for runoff.
- Reducing the amount of runoff water or recycling the runoff on your property.
- The use of vegetative buffers as filters can also greatly reduce the amount of *E.coli*, as well as other constituents, in the runoff.

From a research perspective there are several questions that need to be answered. Some of the questions that are the basis for continuing UC research include:

- What is the practical effectiveness of certain practices such as buffer strips, or timing of irrigation to reduce the risk of bacteria being transported by irrigation water?
- Can we measure the impact of water quality management practices at the ranch scale? Will those activities make a measurable difference in the water leaving the ranch?
- Do the indicator bacteria actually represent pathogenic bacteria in the water and therefore are the water quality standards meaningful from a public health perspective?
- What is the rate of pathogenic *E.coli* shedding on typical cow-calf operations?
- Can we distinguish *E. coli* from different animal sources via DNA tracking or other means?

We hope to conduct research to help answer these and other questions so we can continue to make productive use of irrigated meadows and pastures.

Why is the Grass Greener Under that Oak Tree?

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Tehama, Glenn, Colusa

Is the grass really greener under those oak trees? Previous studies have found that removal of oak trees enhanced forage production, however, only for a short time. In order to determine why, UC research published in the California Agriculture journal sheds light on the difference in the soil fertility and quality: under the blue oak canopy, in the adjacent open grassland and in periods after oak tree removal (5, 15, 21 & 34 years removed before sampling).

The study found soil fertility and quality was highest under the oak canopy for all soil parameters measured. Interestingly, this was not due to the presence of grazing livestock "camping out under the trees" as no differences were seen between grazed and un-grazed sites. Top soil horizons (A and AB) were deepest under the oak canopy, which is likely due to the amount of organic matter created by the trees. Previous research at Sierra Research and Extension Center found that blue oaks contribute high amounts of organic matter to the soil through the dropping of leaves, twigs and acorns. In this study, removal of trees showed a reduction of organic matter in the soil after ten years. The increased organic matter and quality of the soil under the tree canopy created opportunities for biota (earthworms, microbes, plants, etc.) to proliferate.

High amounts of organic matter and organisms to break it down (biota) lowered the bulk density (soil compaction) of soils below the tree canopy, which increased the water infiltration rate and reduced soil erosion and leaching of nutrients (also benefited by longer tree roots). With the removal of trees, and subsequently the soil organic matter, an increase in bulk density occurred over time.

Additionally, the higher levels of organic matter and greater water infiltration under the canopy provided nutrients (nitrogen, phosphorus & potassium) that increased soil fertility. Organic matter contributed nutrients through its own structure, and added infiltration increased the uptake of water that captured nutrients from the tree as it dripped through the canopy. As with the organic matter levels, removal of trees significantly lowered soil fertility 10 years after tree removal. It was also found that blue oak cycling of calcium, magnesium and potassium increased base saturation (cation exchange capacity), which decreased the acidity under the tree canopy.

Thirty years after oak tree removal, soil fertility and quality were similar to those of adjacent open grasslands. Removal of trees initially increased forage production by eliminating grass and forb competition with trees for water, light and

nutrients. However, the benefit in forage production was short lived once the interdependent soil fertility and quality benefits provided by the oaks diminished. Approximately 10 years after tree removal, forage production under the tree canopy dropped below pre-removal levels, which means the productivity of the entire pasture was reduced. Thus, it is necessary to have a balance in managing oak woodland canopy cover to realize the benefit of oak tree nutrient cycling and still provide adequate amounts of light and moisture to forage species.

Source

Randy A. Dahlgren, William R. Horwath, Kenneth W. Tate, and Trina J. Camping (2003) "Blue oak enhance soil quality in California oak woodlands", California Agriculture: Vol. 57: No. 2, Page 42. http://repositories.cdlib.org/anrcs/californiaagriculture/v57/n2/p42

Making Decisions in the Information Age

Dan Drake, Livestock Advisor, UCCE Siskiyou

There is now more information and more different subjects impacting ranchers than ever before. The quality has never been more suspect. Who do you believe? Sometimes it is easier to not make a decision thereby accepting some default condition. Collecting "advisors" and "advice" can be critical to success.

Honesty, integrity, and common interests are important factors in selecting an "advisor" or advice. It isn't easy to know who to listen to. For example, those that are part of an alliance or vertically integrated not only have a defined available market, but often have access to information from specialists with some common interests. Those interests may not be perfectly aligned but as an integrated unit will have some common goals.

These advisors that are hired, either directly or indirectly, such as our veterinarian, our seed or equipment supplier, or our lawyer, require a different relationship than with our weekend roping crew. Different can sometimes be something we avoid.

Do not outsource the final decision-making. If it is too complicated to understand, find someone that can explain it so you understand. Then you can make an informed decision that is right for you. You don't have to understand everything as much as an expert, but you need to understand the ramifications and how they impact your whole operations and goals, and only you know those best.

Drought Sales of Livestock: Managing the Taxes

Glenn Nader - UC Farm Advisor
Matt Byrne – Calif. Cattlemen's Assoc. Executive Vice President

Drought conditions and a lack of feed in many parts of the state this year have raised many questions about various management options available to reduce the impact on your operation. Weaning calves early, purchasing feed, leasing additional pasture, or reducing herd numbers are some of the options available to you.

It is important to consider the fact that selling animals can trigger capital gains taxes. There are two provisions in the tax code that address the ability of livestock owners who exercise this drought management decision to avoid additional tax liability.

Code Section 451(e)
Allows ranchers whose principal business is agriculture and who use a cash accounting method to postpone reporting the taxable gain on sales of any livestock above the yearly average sales for one year. To qualify the producer's county must have received a federal disaster declaration. Sales related to the drought under this section can qualify even if they occur prior to the declaration.

Code Section 1033(e)
Allows ranchers whose principal business is agriculture and who use any accounting method to postpone, and altogether avoid, paying taxes on the gain from the sale of breeding animals above the yearly average sales if they are replaced within a specified time frame. The time frame varies depending on whether or not your county was declared a federal drought disaster.

- In federally declared drought counties, the replacement period ends at the conclusion of the first taxable year after the *first drought-free year* for that county. The 'first drought-free year' is determined based upon the U.S. Drought Monitor at *http://www.drought.unl.edu/dm/monitor.html*. IRS will publish a list each September of the counties for which a drought exists.

- In counties not declared federal disaster area the replacement period ends *two years* after the close of the tax year in which the involuntary sales occurred.

The information in this article is a guide to help you examine the management options available to you. To ensure that you qualify for tax relief under either of these code sections it is advisable to speak with a tax professional.

References

National Cattlemen's Beef Association, 2007, Q&A: Tax Options for Drought Sales of Livestock, National Cattlemen's Beef Association, Washington, D.C. 20004, (202)347-0228 http://www.beefusa.org/uDocs/gaondroughttaxmay07.pdf

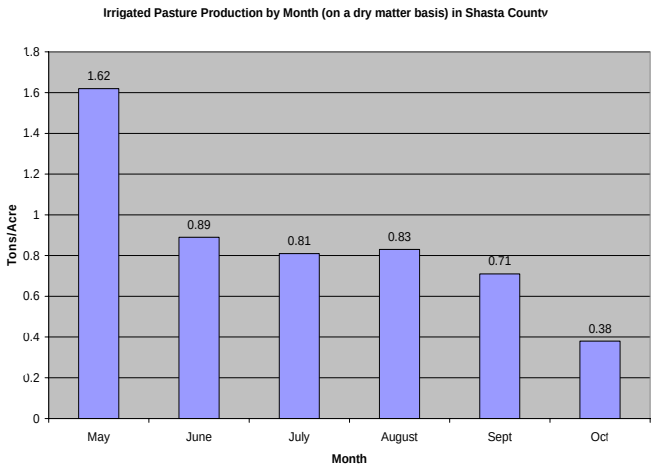
Monthly Irrigated Pasture Production in Shasta County

Larry Forero, Livestock Advisor-UCCE Shasta, Allan Fulton, Irrigation & Water Resources Advisor-UCCE Colusa, Glenn, and Shasta

Irrigated pasture production locally can seem mysterious. In May and June there is more forage available than can be consumed but as we ease into the summer, the forage available for livestock diminishes. As autumn approaches, the hope is there is enough grass to get to winter.

In an effort to learn more about the monthly production of irrigated pasture, we clipped plots from five ranches in Shasta County (elevation ranged from 450-1700 feet).

The monthly production data from all five ranches was averaged in figure 1 below.



Knowing the general production curve for pasture production locally can help producers think about how to manage pastures more efficiently. Knowing what production is in later season can help to drive marketing and feeding decisions. Some considerations might include:

1. Haying pastures in the spring to take advantage of seasonal flush of forage
2. Installing some cross fences that would facilitate better forage management (i.e., banking grass for the fall)
3. Help develop fertilization strategy
4. Recognize when there could be a seasonal shortfall of feed and sell or move livestock before it occurs

Blackberry Management

Larry Forero, UCCE Livestock Farm Advisor
Joseph M. DiTomaso, Vegetable Crops/Weed Science, UC Davis
Paul Kjos, Shasta County Deputy Agricultural Commissioner/Sealer of Weights & Measures

Blackberry brambles infest many acres of pasture land in northern California. They quietly invade pasture resulting in a reduction of available forage for livestock. Imagine a field 667 feet by 667 feet (ten acres). This field has blackberries along the fence line out into the pasture ten feet along the entire perimeter of the pasture. The area encompassed by the blackberries is 0.60 acres-over 5% of the entire field. At 10,000 lbs/acre production, that is a loss of 6 AUM's in one season.

Understanding the biology of the blackberry plant will help you better manage this pest:

1. The seeds are readily spread by wildlife
2. The plants produce canes from the central cane as well as from rhizomes
3. A single blackberry plant can live 25 years.
4. They may be self-pollinated or pollinated by honey bees
5. First year canes do not produce flowers
6. Second year canes fruit and die
7. Tips of the first year canes that contact the ground form roots at the nodes.

The tools available to help manage blackberries include:

1. Burning
   A. Burning blackberries can reduce canopy short term. It is not a good long-term strategy cause plants will resprout from the base.

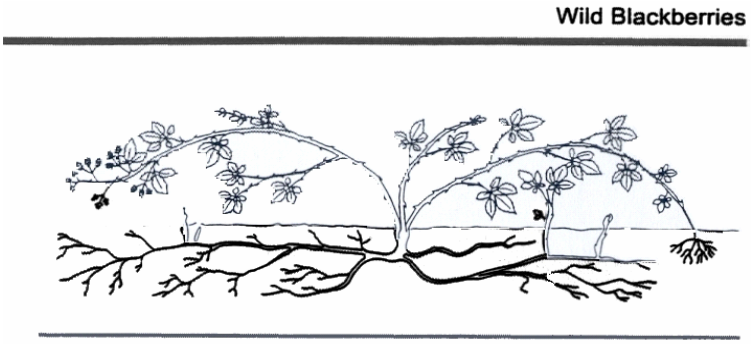


Figure 5. Vegetative growth of a blackberry plant from a central crown.

2. Mechanical
   A. Wild blackberries can be controlled by REPEATED tillage
   B. Bulldozing can cause resprouting and can spread the pest by means of root and stem fragmentation
   C. Mowing is not effective because it stimulates formation of suckers from lateral roots and induces branching

3. Biological Control
   A. There is no biological control method available in the US. In Australia, blackberry leaf rust has been released for control of the weed. It is not generally considered successful because the rust does not do significant damage to the host. Although the rust was recently found in Oregon it has had sporadic success. It is also in California, but has not been effective.
4. Herbicide
   A. Common herbicide products include Glyphosate (Round-up®), Triclopyr (Garlon ®4-61.6% Triclopyr) or Tri clopyr/2,4-D (Crossbow®—34.4% 2,4-D, 16.5% Triclopyr)

These products behave differently and it is important to apply the product at the right time and at the appropriate rate. Table A summarizes rate and timing, but refer to the pesticide label for specific information.

TABLE A

Product	Rate	Water	Timing	Application
Round-up	0.5-1.5%	0.6-2 oz/gallon of water	Late summer/early fall	Spray foliage to wet
Garlon	1%	1.25 oz/gallon of water	Mid-summer and later	"
Crossbow	1%	1.25 oz/gallon of water	Mid-summer and later	"

As a quick review…

2 cups/pint
2 pints/quart
4 quarts/gallon

8 fluid oz/cup
16 fluid oz/pint
32 fluid oz/quart
128 Fluid oz/gallon

When herbicides are used, it is critical to read and follow all label instructions-understanding the label improves efficacy and assures the product is being applied safely. Some products require a restricted materials permit where others only require an Operator ID. If you have any questions about this call your local Agriculture Commissioner's office.

TABLE B - SUMMARIZES THE PRODUCTS OUTLINED ABOVE.

Product	Operator ID	Restricted Materials Permit	Notice of Intent	Use Report
Round-up	Yes	No	No	Yes
Garlon	Yes	No	No	Yes
Crossbow	No	Yes	Yes	Yes

If you are considering spraying blackberries take some time to review and consider the following:

1. Think carefully about the goals for your property/operation
2. Blackberry control and management requires persistence-be sure you commit the time it takes
3. Try to work on projects with measurable objectives that move you along towards your goal
4. Remember the rules-check with your Agricultural Commissioner locally to make sure you understand the process for obtaining permits, operator ID and submission of reports.

References

DiTomaso, J.M. "*Pest Notes: Wild Blackberries.*" IPM Education and Publications, University of California Statewide IPM Program. UC ANR Publication 7434. http://ipm.ucdavis.edu/PMG/PESTNOTES/pn7434.html.

Let us know what you think!!!

This newsletter contains articles written by University of California Farm Advisors, Specialists, and Program Representatives. Our aim in writing this newsletter is to provide the ranching community in the Sacramento Valley with science based information for your consideration. Our intent is that this newsletter will be published on a quarterly basis. We welcome your feedback and encourage you to call or email with questions, comments, or ideas for future articles.

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