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TEHAMA, GLENN, COLUSA COUNTIES

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Fly Impacts and Control on Cattle

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Fly season during the summer months is more than just an annoyance to cattle. The three main culprits are horn flies, stable flies, and face flies, and each of these flies can impact your bottom line. Both horn flies and stable flies feed on cattle blood with bites being quite painful to animals. Horn flies bite and feed on the back of cattle, moving to feed on the belly when daytime temperature is high. Between blood meals, horn flies remain on cattle leaving the animal only to lay eggs in fresh fecal pats. Stable flies bite the legs and sometimes belly of cattle, leaving the animal after feeding to digest the blood meal while resting in the nearby environment. While face flies don't feed on cattle blood, they do feed on eye and nasal secretions and are known to spread *Moraxella bovis* (bacteria causing bovine pink eye or infectious bovine keratoconjunctivitis), irritate open wounds, and cause tearing of the eye. Like stable flies, face flies leave their animal host after feeding and may be found resting on nearby structures or trees.

Economic Impact of Horn Flies: UC research in 1968 found cattle with horn flies spent more time in the shade fighting flies rather than grazing. To determine how much effect this had on weight gain, groups of cow/calf pairs were split into treatments of fly control and no fly control. The calves receiving fly control gained an average of ½ lb/day more than those receiving none (Loomis et al., 1969). Another trial suggested that each 100 horn flies per cow can decrease the calf's weaning weight by 17.9 lbs (Steelman et al., 1991). Similar yearling steer and heifer gain reductions have also been documented (DeRouen et al., 2003). In neither calves nor yearling cattle have compensatory gains been the norm, meaning these weight gain losses seem to follow fly infested cattle through their production life (Quiesenberry and Strohbehn, 1984). It is notable that in some areas, and in some cases with the Brahma breed, it has been found that some cattle are unaffected by fly levels, but in general, heavy fly infestations significantly decrease production. How do horn flies cause cattle to gain less weight? Their painful bites elevate cattle cortisol levels, lessen cattle ability to retain nitrogen, and reduce water consumption, grazing and mastication efficiency (Harvey and Launchbaugh., 1982; Byford et al., 1992).

Economic Impact of Stable Flies: The bites of this fly are particularly painful – you may know this if you have been bitten by these flies which many ranchers simply call "biting flies" because they will bite people in addition to cattle. Like horn flies, the painful biting activity of stable flies is known to reduce cattle weight gains and feed efficiency (e.g. Campbell et al. 2001) resulting in economic costs to livestock producers estimated at nearly $1 Billion (Taylor and Berkebile 2006). Stable flies are most abundant in spring and early summer (Mullens and Meyer 1987) and during years with greater rainfall during early spring (Mullens and Peterson 2005).

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In addition, the website has many UC publications and information on topics such as livestock, range, natural resources, pest control, and other agriculture and crop production areas

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Economic Impact of Face Flies: These flies feed on secretions/excretions around the nose, mouth, and eyes of cattle. While they do not deliver painful bites, their mouthparts are adapted for scraping and this can greatly irritate the eyes of cattle on which they feed resulting in increasing eye secretions and tearing. In addition, these flies are known to transfer bovine pinkeye and eyeworms among cattle within a herd as they move among nearby animals during feeding. Pinkeye can result in a decrease in weight gain estimated between 15 and 30 lbs in affected calves at weaning (Thrift and Overfield 1974).

Given the production losses from heavy fly infestations, control of all three flies is economically warranted.

Control of Horn Flies: Fly ear tags, dust bugs and oil rubbers, and pour on applications are the most common insecticidal methods of dealing with flies, but how well do they work? In the UC trial mentioned above dust bags were very effective in controlling horn flies when placed in the entrance to water, which forced cattle through them. Multiple other trials found similar results. In most trials where cattle were given free choice to dust bags, as compared to being forced to walk under them, reductions in efficacy were seen. Pour on insecticides can also be effective in reducing horn flies. Research varies on how long they are effective, but most trials seem to fall between two and four weeks' time. Feed-through insect growth regulators (IGR) that are commonly used in mineral supplements have demonstrated effectiveness since the 1970s. Horn flies develop only in fresh cattle manure, so insecticides that pass through the digestive system of cattle and are present in the feces can kill developing immature flies. Early research has shown these products can control 87% of horn fly development in the field (Harris et al., 1974).

Ear tags have been in use since the 1980s and have been very effective for horn fly control. (Williams et al., 1981). However, in recent years horn flies have become resistant to several of the insecticides used in ear tags. Resistance from not following label instructions on when to remove ear tags, using only a single ear tag on cows, or not rotating ear tags with different active ingredients are all possible causes. When control failures occur, ear tags containing a different insecticide should be used.

A trial that compared differing pasture sizes, rotational stocking rates, and continuous stocking found no difference in horn fly numbers associated with these factors (Steelman et al., 2003). It appears the flies are present regardless of grazing management and some form of control is necessary to lessen production losses.

Control of Stable Flies: The most effective way to reduce stable flies is to reduce their development sites near cattle. Stable flies will develop in wet, decaying organic material with urine soaked hay being a particularly productive material. Where cattle are fed hay to supplement pasture forage, the position of feeding stations should be altered regularly to reduce the build-up of soiled hay on the ground in these locations. Piled manure or silage will also produce stable flies unless this material is properly composting (including regular turning of the pile). Adult stable flies are challenging to control. Insecticides can be applied directly to cattle (apply insecticides to the legs and belly) or to cloth targets placed near feeding and watering locations where cattle congregate (Foil and Younger 2006) so that flies will rest on the treated targets between blood meals. Similarly, stable fly traps (e.g. "Bite Free", Central Life Sciences) can be placed at cattle congregation sites to capture stable flies resting between blood meals. Ear tags will not provide control of stable flies. Another option to control stable flies and house flies is the release of parasitic wasps, although the research on the effectiveness of this method is sparse (Weinzierl and Jones, 1998). These predators need to be released where flies breed multiple times during the season and are best suited for feedlots or moist areas where cattle congregate (Greene et al. 1998). Parasitic wasps will reduce fly numbers by inserting their eggs into immature stages of flies. The emerging wasp larvae will kill their hosts as they grow and feed on them. The predator wasps need to be released regularly to make an impact and they do not sting people or animals. However, they may be negatively affected by the concurrent use of insecticides, such as macrocyclic lactones.

Control of Face Flies: Adult face flies are also difficult to control because they spend very little time on cattle. Insecticides can be applied by cloth wipe to the face of cattle with particular attention to the area around the eyes. Ear tags can provide some relief from face flies though a sufficient level of control is rarely achieved using only ear tags. The most effective means of control is through the use of feed-through insecticides as face flies, like horn flies, develop only in fresh cattle manure. It is important to understand that face flies can travel over a mile, so if an IGR is the only form of fly control, flies on a neighboring property are unaffected and may move in.

Summary: Fly control appears to be an economical practice with multiple tools being available. In some cases using several tools in conjunction with each other may be necessary to economically maintain weight gain.

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Beef Quality Assurance Training and Certification

August 15, 2019

10 AM—12:30 AM

11010 Foothill Road, Los Molinos, CA 96080

Beef Quality Assurance (BQA) is an industry driven program designed to instruct and certify the application of common livestock practices to ensure a quality product that is free of defects and blemishes, while maintaining manager and animal health. Recent preliminary data released by Colorado State cites a $2.69/cwt premium for video marketed cattle that were mentioned as BQA certified in the lot description. Regardless of market premium, BQA certification as a program provides an avenue to deliver a high quality product industry wide with the intent of instilling consumer confidence in how it is produced.

Agenda

10:00 AM Introductions, background of the program and goals, inside instruction

10:45 AM Outside corral demonstration

12:00 AM Certification exam and closing

Please RSVP to the UC Cooperative Extension office in Tehama County 530-527-3101. There is no charge for the program, but your RSVP ensures enough course material will be provided at the meeting.

Comparing the Last Two Years of Rangeland Production

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Leslie Roche—Cooperative Extension Specialist, Department of Plant Sciences
Jeremy James—SFREC Center Director

Forage production on California annual range is highly variable. A comparison of the last two years in Shasta and Yuba County helps to depict the reasons why. Although rainfall is the most important factor affecting production, in some cases other factors prove important. This is evident in the previous two seasons at these sites. This is not an attempt to demonstrate what forage production was across the Northern Sacramento Valley, but rather to demonstrate how both rainfall and temperature can influence production in two unique years.

Figure 1 presents long-term ranch data (Shasta County, near Redding Airport) with an average annual production of about 1,500 lbs/acre. The 2017/18 (Oct – June) forage production was close to 2,000 lbs/acre (125% of normal) with a rainfall total of 60% of average. The 2018/19 forage year saw rainfall at about 130% of normal with forage production at about 106% of normal.

Figure 2 shows the average monthly and seasonal (peak) production for 2017/18 and 2018/19 at the UC Sierra Foothill Research and Extension Center near Marysville (Yuba County), which exhibited similar trends to the Shasta County site. The forage produced in 2017/18 was 178% of normal (with significantly less than average seasonal rainfall). The extremely wet 2018/19 forage year resulted in about a 25% increase in forage over the long-term average. Comparing these two years at each site illustrates the importance of climatic conditions. Notice the missing data for the December 1st forage clipping in Figure 2 for 2018/19, which was due to no measurable fall forage growth. Figures 3 and 4 show forage conditions in Tehama County in October and December of 2019.

Figure 1.

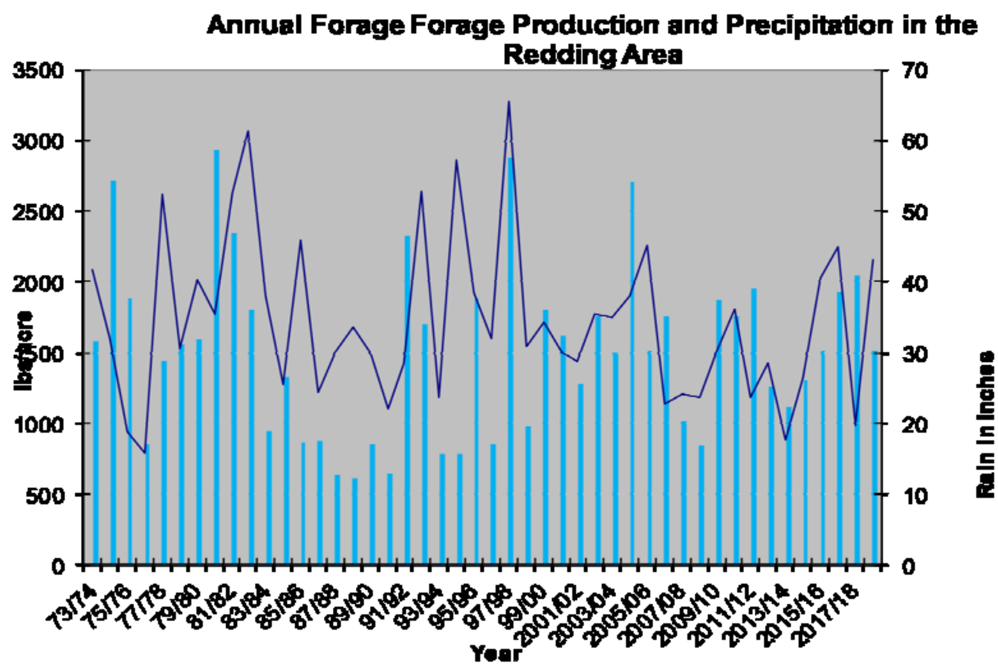

Figure 2.

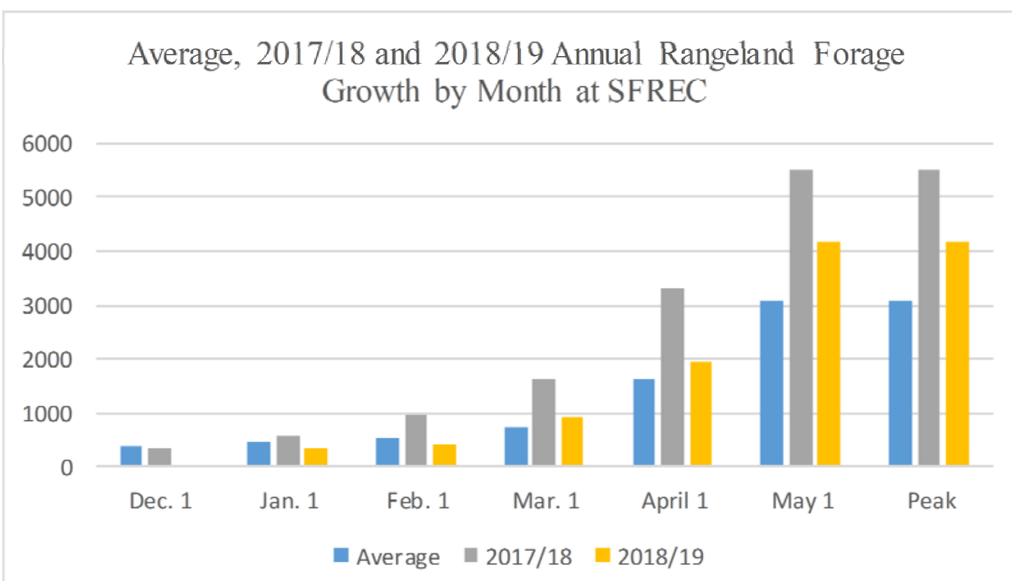

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Figure 3
Oct. 19, 2018 Forage Conditions in Tehama County

Figure 4
Dec. 9, 2018 Forage Conditions in Tehama County

Comparing these two sites reminds us that the amount of forage produced is closely tied to the timeliness of rainfall and the importance of temperature. Table 1 shows the amount of early fall rain between the two seasons. Fall rains that bring ½ to 1 inch within a week will cause germination. Recall that in the 2018/19 forage season the rain received in November was late in the month, while 2017 received earlier germinating rains. Earlier germination provides more fall growth and also more time for root development to occur. Although above ground growth ceases when soil temperature drops below 50 degrees, root growth continues. More developed roots lead to greater growth once temperatures again warm above 50 degrees in the spring and rapid growth begins.

This highlights the second difference between the 2017/18 and 2018/19 growing seasons. Table 1 shows that March 2017/18 was over 12 degrees warmer on average than March of this year, which is why we witnessed a later start to rapid spring growth.

The weather data points out that while winter rainfall is necessary for filling stock water ponds and ground water reserves, the minimal water use of annual grasses during the cold season make mid-winter rains less important for forage production if timely spring rains occur. In the 2017/18 season almost no December rainfall was seen, and February was less than an inch. In seasons that lack timely spring rain, heavy winter rain may be more important in filling the soil profile for early spring forage use, contributing to a greater impact on production. This of course would require soils with the ability to retain moisture into the spring season, which is not always the case.

Table 1. 2018/19 and 2017/18 Weather Data from Shasta College CIMIS

Month	Rainfall, inches		Avg Temperature, F	
	2018/19	2017/18	2018/19	2017/18
Sept	0.08	0.52	70	72.8
Oct	0.63	0.43	63.4	62.1
Nov	4.64	7.86	53.1	51.2
Dec	4.71	0.003	46.1	46.1
Jan	9.55	5.45	48.1	48.1
Feb	12.31	0.85	43.1	48.5
March	10.36	5.07	50.4	62.5
April	2.7	4.58	61.4	57.3
May	4.17	1.14	63.2	67.8

While these two example sites show greater than average production the last two years, it is difficult to predict the future. Now might be a good time to meet with your local Farm Service Agency (FSA) and/or rainfall insurance provider to keep your file updated (new leases, etc). It is worth the time to talk with the USDA-Farm Services Agency to apprise them of range and forage conditions and discuss your specific situation.

Determining Volume in a Small Pond with a Staff Gauge

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Determining stored water volume in stock water ponds has become a requirement for many landowners. Through SB588 the California State Water Resources Control Board (Water Board) requires the monitoring of water being diverted and put to beneficial use. Stock water ponds are part of this requirement. The water board's deadline for installation of a monitoring method has already passed, meaning if not done, this should be completed immediately. The frequency of reporting stock water pond volume depends on the size of the pond. This could change, but as of 2019 the current reporting requirements listed by the water board in the table to the right:

Pond size Acre feet	Frequency of reporting
<10	Once
10-49	Monthly
50-199	Weekly
100-999	Daily
>1,000	Hourly

https://www.waterboards.ca.gov/waterrights/water_issues/programs/diversion_use/water_use.html

Ponds over 100 acre feet require either the completion of a UC water measurement course by the land manager or measurement must be set up by a contractor, professional or engineer. Ponds under 100 acre feet require an individual with experience in measurement and monitoring. This article provides a method of determining the volume of these smaller ponds. This method is most practical for ponds under 50 acre feet, as the monitoring requirements of larger ponds will likely require some form of automation.

Since stock ponds aren't flat bottomed, the simplest way to monitor water volume is with a pond curve showing the total volume stored as the water level changes throughout the season. While pond curves are available for some ponds in CA, it is not uncommon for ponds constructed decades ago to have never had a staff gauge installed or a pond curve developed. If your pond is registered with the Bureau of Dam Safety, was designed by the USDA NRCS or Resources Conservation Districts (RCDs), or was surveyed during an inspection by the Water Board, a pond curve may be available. Check with those agencies to see if they can provide it. Pond owners can send an email request to the CA State Water Resources Control Board (SWRCB) at dwr-measurement@waterboards.ca.gov, with the Water Right ID's of interest, to see if the Division has a depth capacity curve or survey information that the diverter can use to construct the curve for their water right.

If a pond curve can't be found, one will need to be developed. It can be accomplished by measuring the water and corresponding surface area of the pond for at least three or four different levels between full and empty. This can be accomplished by installing a staff gauge.

(Figure 1.) Because of the irregularity of many reservoir bottoms, the staff gauge needs to be installed in a location that represents the average ground level of the bottom of the pond. A handheld GPS unit (or smart phone with GPS capability) can then be used to determine surface area (Figure 2.)

Figure 1. Staff Gauge

Figure 2. GPS Unit noting area

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Determining Volume in a Small Pond with a Staff Gauge continued…

The timing for beginning this project is late summer/early fall when the pond is at its lowest elevation. Here are the steps for completing the measurement.

1. Install the staff gauge in a location that represents the average ground level of the bottom of the pond. It must be plumb to get an accurate reading. If you have an existing staff gauge that is installed at an angle the App will not work until a relationship can be made between the demarcations on the angled staff gauge and actual pond depth.
2. Note the level of the water on the staff gauge.
3. With a GPS unit or smartphone app, set to "determine area" and walk around the water line (at water's edge) of the pond to determine the surface area. **Record the Surface Area in square feet and corresponding Depth in feet**. Table 1 shows potential sources and cost for example types of equipment.

Table 1. Selected GPS equipment costs

Measuring Device	Cost	Compatibility
Garmin Etrex 10	$110	Standalone GPS Unit
GPS Fields Area Measure	Free	ios smartphone
Fields Area Measure	Free	android smartphone
Field Navigator	Free	android smartphone

4. As the pond fills, repeat this process to establish the relationship between depth of the pond and surface area of the water. Table 2 is an example of measurements taken across four different days throughout the season.

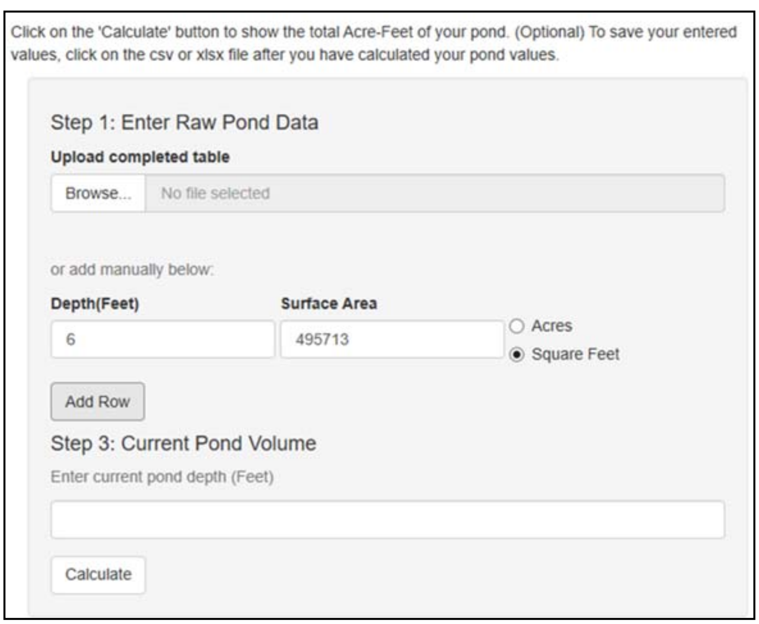
Table 2.

Date	Depth (ft)	Surface Area (square ft)	Surface Area (ac)
N/A	0	0	0
8/31/2018	1.0	27,940	0.64
11/15/2020	3.5	230,860	5.30
1/31/2019	5.5	426,888	9.80
2/28/19*	6	495,713	11.38

*Pond is at Capacity-overflowing

5. Go to : https://ucanr-igis.shinyapps.io/PondCalc/ and follow the steps to generate a personalized pond curve. For full functionality, view this website using google chrome. Figure 3 is a screen shot of the App.
   a. To familiarize yourself with the App, try entering the data from this article (Table 2) and compare the outputs. It is important that after entering each depth and surface area, you confirm your entry by clicking on the "add row" button.

Figure 3. Screen shot of the Pond Volume Calculator



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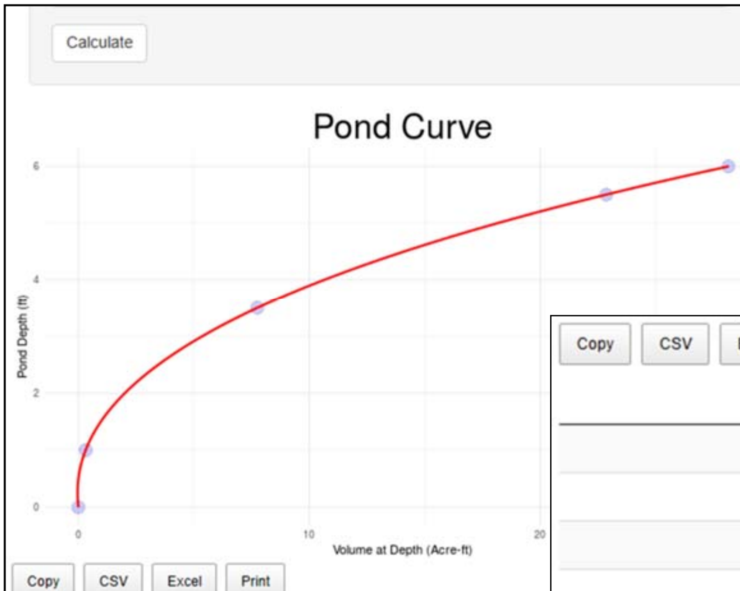
b. After you have entered all your collected data (depth and corresponding surface area), a pond curve will be automatically generated (Figure 4).



Copy | CSV | Excel | Print

depth	area
0	0
1	27940
3.5	230860
5.5	426888
6	495713

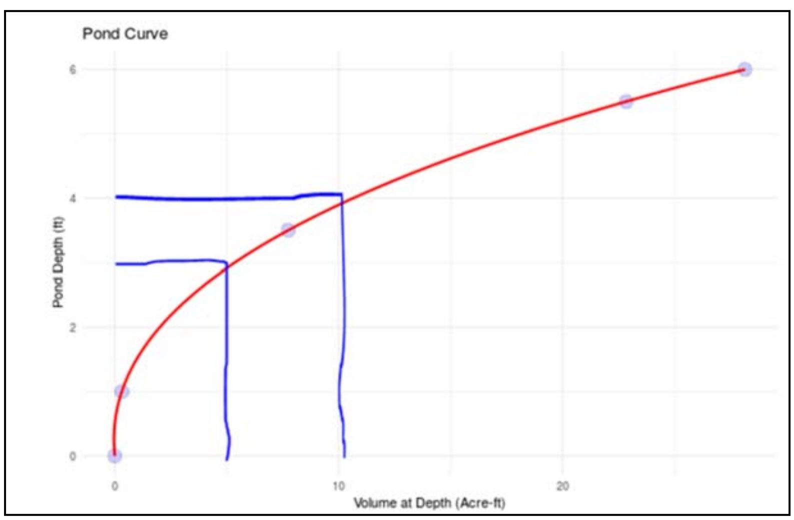
Showing 1 to 5 of 5 entries

c. For incorrect values, click on the incorrect row and click "Remove selected rows". The pond curve should adjust automatically.

d. The pond curve is calculated using a three-factor polynomial equation and is suitable for most ponds. To improve the accuracy of the curve, increase the number of data points (pond depth and corresponding surface area).

e. This App will not work for ponds with islands or channels cut into in the pond.

Figure 4.
Pond Curve developed from depth and corresponding surface area data. Example provides relationship between pond depth and water volume (acre feet)



6. After a pond curve is developed (Figure 4) it can be used to track changes in total volume using staff gauge readings. If you want to know the change in volume during the month of November, you would note the staff gauge reading on November 1. In this example, the staff gauge read 3'. The corresponding volume is five acre-feet. You read the staff gauge again on November 30th and it reads 4'. The corresponding volume is ten-acre feet. The increase in volume is 5-acre feet. Table 3 outlines this change.

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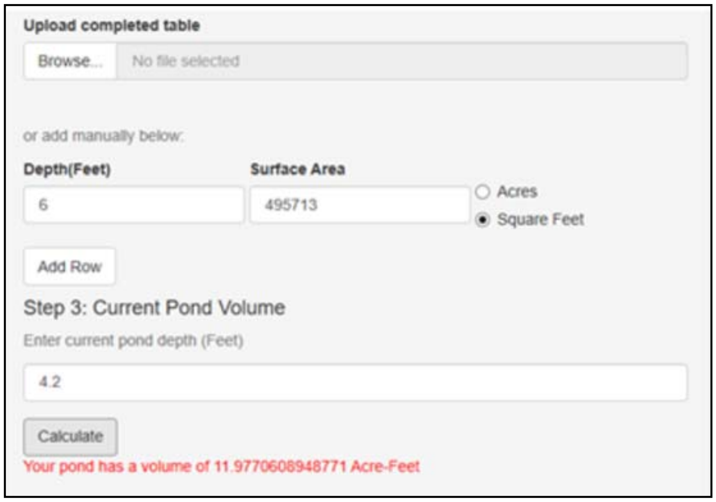
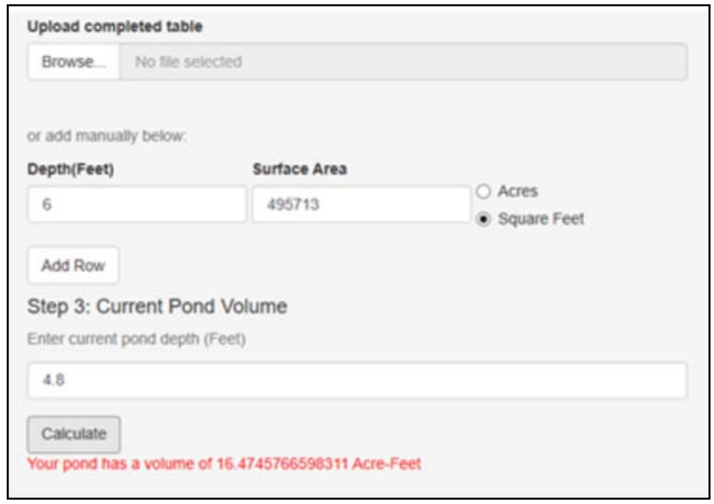
Table 3. Volume change data based on pond curve.

Date Staff Gauge Read	Staff Gauge Reading	Corresponding Volume
November 1	3’	5 acre feet
November 30	4’	10 acre feet
Change		Increase of 5 acre feet

Once the curve is established, the App can also be used to calculate pond volume. Step 3 in the App will let the user key in a value and “Calculate” the pond volume at that depth.

Figure 5.



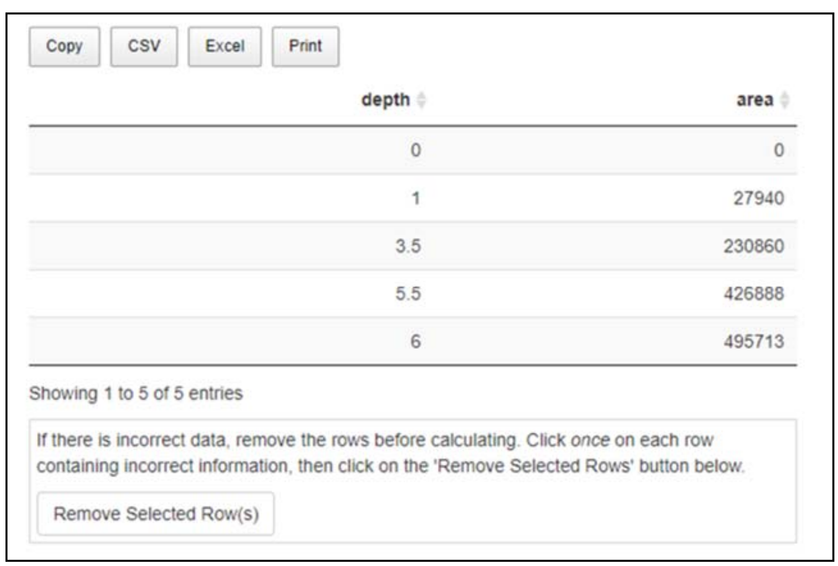


7. This function can also be used to determine volume change in a month. Assuming that a water level of 4.2 feet (Figure 5, Left) was collected in Jan. 1, we calculate a volume of 11.98 acre-feet. On Jan. 31, the depth moved to 4.8 feet (Figure 5, Right) to calculate a volume of 16.45 acre-feet. The increase in volume for the month is therefore 4.7 acre-feet. Table 4 summarizes this approach.

Table 4

Date	Depth	Acre Feet Storage (from App)
Jan. 1	4.2 ‘	11.98
Jan. 31	4.8’	16.45
Change in Jan.		4.47 (increase)

8. To save your inputs so that you do not have to manually enter all the individual values, select one of the export options (CSV, Excel) using the buttons above the table. This generated file can be modified and uploaded to the app as more information is collected.



Nitrogen Fertilizer Considerations for Pasture

Josh Davy—Livestock and Range Advisor Tehama, Glenn, Colusa
Larry Forero—Livestock, Range and Natural Resources Advisor Shasta, Trinity

Nitrogen fertilizer will almost always give an economical production response on irrigated pastures with less than 50% clover. An acceptable economical rate targets the application of 50 units of actual nitrogen per acre. This rate will provide enough nitrogen to create a quick flush of growth without worries of excessive waste or cost.

There are multiple nitrogen fertilizers available and the choice of which to use is a function of cost and the convenience of application. Cost should be considered on a per unit of nitrogen basis as the target is to apply 50 units to the pasture. Generally, fertilizers with a higher percentage of actual nitrogen are cheaper to apply. The table shows current costs per acre to apply 50 units of nitrogen by each fertilizer source. The two highest cost nitrogen sources are 11-52-0 and 16-20-0, which is because they also contain phosphorus, which is often necessary but a topic for another discussion.

The lowest cost nitrogen fertilizer is urea, but it doesn't come without some necessary consideration. If urea is applied and enough moisture is present to melt the prills, it will convert into ammonia gas and volatilize until watered in with the equivalent of roughly 1/3 inch of rain. As much as half the applied nitrogen can be lost in as little as two weeks. The best way to limit volatilization of urea is to apply to dry ground and irrigate. Care should be taken to not apply so much water that the nitrogen moves below the root zone. There are several products available that can help slow the process of urea breakdown to ammonia gas, which keeps it from volatilizing. These products add cost but can be beneficial in preventing nitrogen loss. Example products include Agrotain and Eclipse. Helena Chemical also offers a product called Hydra-Hume that claims to provide multiple benefits that include protection from volatilization, improved uptake of nutrients, release of nutrients tied up in the soil and buffers the salt effect of fertilizers.

The ammonium fertilizers are relatively stable in terms of volatility. Ammonium sulfate cost nearly double that of urea, but also provides 24% sulfur. Sulfur can be beneficial, but the added cost of this over urea can easily justify a plant test to see if it is necessary. Sulfur is important but isn't needed in large quantities. CAN 17 and CAN 27 are half nitrate nitrogen, which is readily available to the plant. Although more expensive, this product is popular in many crops because frequent applications do not tend to cause the soil to acidify as much as ammonium-based products. This is not generally a problem in irrigated pastures because fertilization isn't a frequent occurrence.

Nitrogen fertilization can provide a boost in pasture production that can be as high as around a ton of forage per acre. For the economics of deciding to fertilize to work the extra forage would need to be consumed by either a cutting of hay or an increase in stocking.

Fertilizer source, nitrogen content, and cost assuming a 50 unit N per acre rate

Fertilizer	Nitrogen, %	Nitrogen units per ton, lbs	$/ton	Cost per unit	Cost per acre
Urea, 46-0-0	46	920	$440	$0.48	$23.91
Urea with additive, 46-0-0	46	920	$482.50	$0.52	$26.22
Urea with Hydra-Hume*	46	920	$640	$0.70	$33.91
Ammonium sulfate, 21-0-0-24	21	420	$360	$0.86	$42.86
Ammonium phosphate, 16-20-0	16	320	$435	$1.36	$67.97
Calcium ammonium nitrate, CAN 27, 27-0-0	27	540	$378	$0.70	$35.00
Monoammonium phosphate, 11-52-0	11	220	$600	$2.73	$136.36
Calcium ammonium nitrate, CAN 17, 17-0-0	17	340	$308	$0.91	$45.29

*Hydra-Hume is applied at the time of urea application at an approximate cost of $10/acre regardless of rate of fertilization. This product might have higher economic return on well managed grass hay operations.

Fertilizer costs change rapidly based upon global supply and demand. What proved to be economical last year may not be the best option this year. Work with your local dealer or Pest Control Operator.

Wildfire Ash Impacts on Irrigated Pasture and Hay

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For much of the late summer and fall, Northern California was enveloped in a thick blanket of smoke and dusted with fire ash. What does wildfire ash on forage plants mean for livestock health, especially relative to the numbers of burned structures containing unknown levels of contaminants? Pasture and hay samples were pulled after the Carr fire to determine if harmful concentrations of metals or other toxicants were present. UC Cooperative Extension (UCCE) and UC Davis researchers are looking for the answer. This project was part of a larger assessment funded by UC Division of Agriculture & Natural Resources and California Department of Food and Agriculture.

Toxicology analysis showed that the metal concentrations were unremarkable for 21 pastures across the state, prior to applying irrigation water. Ten of the pasture samples and six hay samples were analyzed in Shasta and Tehama County during the growing season. Forage sample results found very low (non-toxic) levels of manganese, iron, zinc and copper. There was no detection of lead, mercury, arsenic, molybdenum and cadmium on pasture or hay forage samples. Furthermore, there were only limited findings from an extensive screening for chemical compounds, using mass spectrometry. These mass spectrometry screens are designed to potentially detect a large number of organic compounds belonging to diverse chemical classes (e.g. pesticides, environmental contaminants, drugs and natural products).

Pasture Samples

County	Sample ID	GCMS	LCMS	Lead	Manganese	Iron	Mercury	Arsenic	Molybdenum	Zinc	Copper	Cadmium
Maximum tolerable level, cattle				100	2,000	500	2	30	5		40	10
				ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Tehama	11	ND	ND	ND	11	86	ND	ND	ND	11	5.9	ND
Tehama	12			ND	10	84	ND	ND	ND	5.9	1.7	ND
Tehama	13			ND	22	76	ND	ND	ND	8.6	4.6	ND
Tehama	14			ND	38	430	ND	ND	ND	9.9	3.3	ND
Tehama	15	ND	ND	ND	22	130	ND	ND	ND	6.3	8.9	ND
Shasta	22	ND	Ethoprop	ND	12	68	ND	ND	ND	6.6	3.1	ND
Shasta	23	ND	Caffeine	ND	15	45	ND	ND	1.1	6.9	4.3	ND
Shasta	24	ND	ND	ND	22	75	ND	ND	ND	7.5	2.3	ND
Shasta	25			ND	70	150	ND	ND	1.8	7.8	3.1	ND
Shasta-FR	26			ND	29	40	ND	ND	ND	8.5	3.1	ND

Hay Samples

County	Sample ID	GCMS	LCMS	Lead	Manganese	Iron	Mercury	Arsenic	Molybdenum	Zinc	Copper	Cadmium
Maximum tolerable level, cattle				100	2,000	500	2	30	5		40	10
Shasta-FR	12*			ND	65	84	ND	ND	ND	18	7.1	ND
Shasta-FR	13			ND	99	76	ND	ND	ND	24	9.4	ND
Shasta-FR	14			ND	97	100	ND	ND	ND	23	8.6	ND
Shasta-FR	15*	ND	Ethoprop	ND	61	66	ND	ND	1.1	24	8.9	ND
Shasta-FR	16			ND	55	62	ND	ND	0.83	21	6.7	ND
Shasta	17*			ND	60	260	ND	ND	0.83	29	6.8	ND

*Hay cut, bailed and in the barn prior to Carr Fire.

The data is based upon small numbers of samples so results are considered preliminary at this time. However, it appears that local irrigated pasture and hay did not suffer any toxicological challenges as a result of Carr Fire ash.