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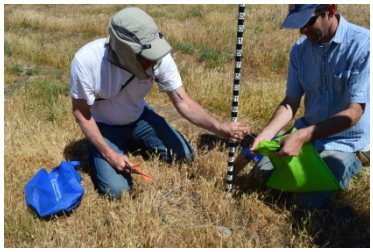
Residual Dry Matter (RDM): How and why do rangeland managers measure it?
By Sheila Barry
For more information see UC ANR Pub. 8092 http://ucanr.edu/pub8092

Fall is the time of year that rangeland managers in California measure or observe how much RDM (residual dry matter) or old herbaceous plant material is standing or on the ground, leftover from last year. RDM is measured in the Fall to provide an assessment of vegetation cover at the beginning of the new growing season. It combines previous years' forage production, decay over the summer and consumption of all grazing animals. For at least the past 30 years, RDM has been the primary standard used by land managers on annual rangelands to assess the level of grazing use. More recently minimum (and sometimes maximum) RDM levels have been used as a performance standard for land management agreements and plans.



How is RDM measured?

RDM can be measured in a small plot but it is estimated for field or site. It can be estimated using photo standards (request a copy from sbarry@ucanr.edu), clipping and weighing sample plots, or a combination of clipping and visual estimates.

Clipping a Plot. The technique for clipping a plot for RDM measurement varies between agencies and individuals. The following procedure, recommended by the University of California, is the method that was used in the research on which the guidelines (Tables 2 and 3, below) are based.

1. Place the quadrat (usually 1 square foot, or about 1,000 square centimeters) on the ground surface.
2. Remove from the area within the quadrat all summer annuals such as tarweed, yellow starthistle, and turkey mullein.

3. Remove tree leaves and twigs.Clip the remaining plant material within the quadrat as close to the ground surface as you can without disturbing the soil.
4. Rapidly collect as much of the clipped plant material as is practical without inadvertently including bits of soil.
5. Weigh the dry plant material (1 gram per square foot = 96 pounds per acre). The plant material should be air dry in October or November unless there has been unusually early rain.

A combination of clipping and visual estimates of RDM is commonly used to reduce time and costs. A structured process such as the Comparative Yield Method (Haydock and Shaw 1975) can be used to combine clipping and observation for an estimate or estimates can simply be made by a trained eye. RDM estimates may be presented on a map as below, meeting or exceeding target RDM levels for a site.

What is the Guideline?

Table 2 and 3 below provide target RDM levels based on tree canopy, slope and rainfall for a site in the Bay Area. Table 2 is for annual grasslands/ woodlands with average annual rainfall 12- 40 inches;

Table 2. Minimum RDM standards for annual grassland/hardwood rangeland in pounds per acre (dry weight)

Woody cover	RDM standard for percent slope (lb/acre)			
(%)	0–10	10–20	20–40	>40
0–25	500	600	700	800
25–50	400	500	600	700
50–75	200	300	400	500
75–100	100	200	250	300

Note: Metric conversion: 1 lb/acre = 1.12 kg/ha.

Table 3 is for coastal prairie, grassland/ woodlands with some perennial grasses and rainfall typically greater than 35 inches.

Table 3. Minimum RDM standards for coastal prairie in pounds per acre (dry weight)

Woody cover	RDM standard for percent slope (lb/acre)			
(%)	0–10	10–20	20–40	>40
0–25	1,200	1,500	1,800	2,100
25–50	800	1,000	1,200	1,400
50–75	400	500	600	700
75–100	200	250	300	350

Note: Metric conversion: 1 lb/acre = 1.12 kg/ha.

What does it mean?

These guidelines are minimum RDM levels to protect soils, minimize nutrient loss, and support forage productivity in the subsequent year. They are based on experiments conducted throughout California from the 1950s- 1970s. Subsequent research has used RDM as a monitoring tool to describe habitat that may support specific native species and animals, although site difference and rainfall are often the primary factors affecting plant species composition and desirable wildlife habitat. The following table summarizes RDM levels that favor some habitat types or species, where site conditions are otherwise favorable for them.

Species	RDM level	Citation
Annual grasses (slender oats, softchess brome, medusahead, ripgut brome)	High	Becchetti et al. 2016
Annual broadleaf plants (burclover, clover, turkey mullein, flowering plants)	Low	Becchetti et al. 2016 Hayes 1998 Hayes and Holl 2003
Vernal pool grasslands	Low	Marty 2005
California Ground Squirrel	Low to Moderate	Fehmi et al. 2005
Bay Checkerspot Butterfly	Low	USFWS 2009
Western Burrowing Owl	Low for nesting	Dechant et al. 2002
Voles	Moderate to High	Fehmi and Bartolome 2002
San Joaquin Kit Fox	Low	USFWS 2010

Bartolome, J. W., W. F. Frost, N. K. McDougald, and M. Connor. 2002. California guidelines for residual dry matter (RDM) management on coastal and foothill annual rangelands. Oakland, CA: Division of Agriculture and Natural Resources, University of California. Rangeland Monitoring Series. Publication 8092. 8 p http://anrcatalog.ucanr.edu/pdf/8092.pdf

Becchetti, T. et al. 2016. Annual Range Forage Production. Oakland, CA: Division of Agriculture and Natural Resources, University of California. Rangeland Management Series. Publication 8018 12 p http://anrcatalog.ucanr.edu/pdf/8018.pdf

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, P. A. Rabie, and B. R. Euliss. 1999 (revised 2002). Effects of management practices on grassland birds: Burrowing owl. Northern Prairie Wildlife Research Center, Jamestown, ND. 33 pages

Fehmi, J.S.; Bartolome, J.W. 2002. Species richness and California voles in an annual and a perennial grassland. Western North American Naturalist 62: 73-81.

Haydock, K. P. and N. H. Shaw. 1975. The comparative yield method for estimating dry matter yield of pasture. Australian Journal of Experimental Agriculture and Animal Husbandry 15:663–670

Hayes, G. 1998. The Saga of the Santa Cruz Tarplant. Four Seasons 10 (4): 18-21.

Hayes, G.F. and K.D. Holl. 2003. Cattle grazing impacts on annual forbs and vegetation composition of Mesic Grasslands in California. Conservation Biology. 17(6):1694-1702.

Marty, JT. 2005. Effects of cattle grazing on diversity in ephemeral wetlands. Conservation Biology 19:1626-1632.

United States Fish and Wildlife Service. 2009. Bay checkerspot butterfly (Euphydryas editha bayensis) 5-Year Review: Summary and Evaluation. August 2009. 42 pp.

United States Fish and Wildlife Service. 2010. San Joaquin Kit Fox- 5-year Review: Summary and Evaluation. Sacramento, CA: United States Fish and Wildlife Service. February 16, 2010. 121 pp.

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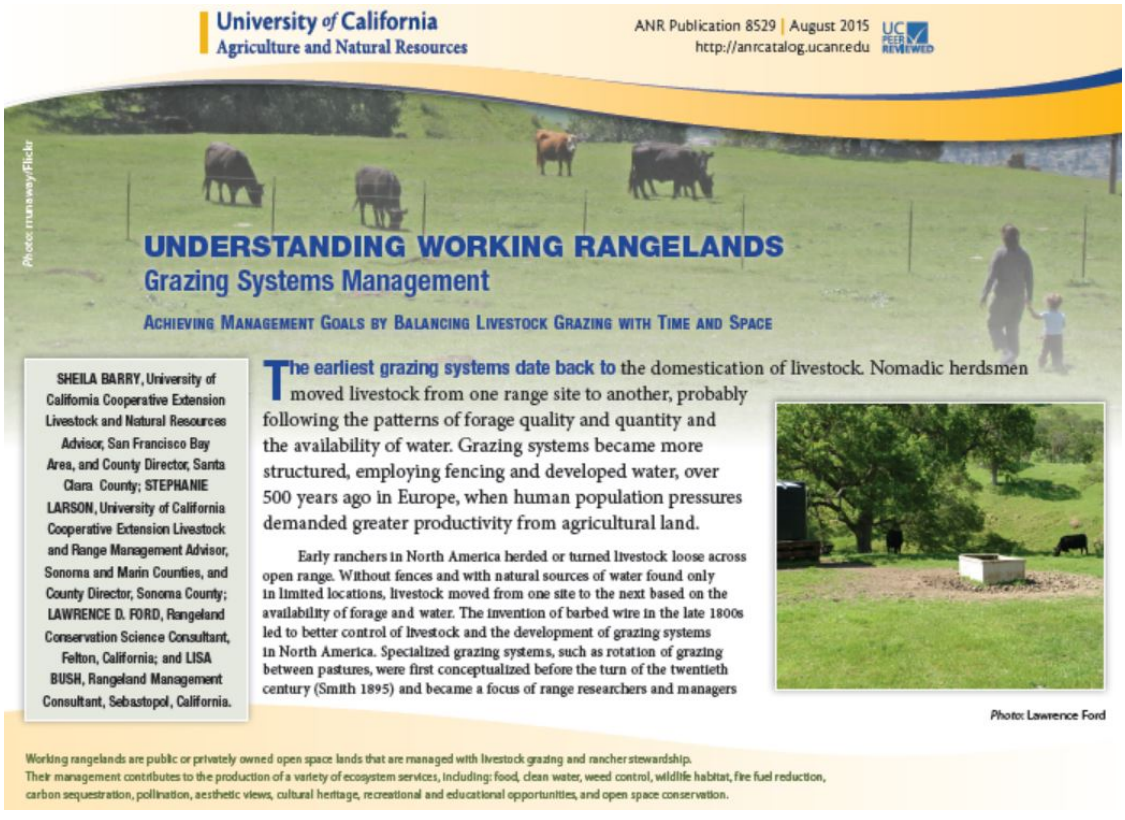
GRAZING SYSTEMS MANAGEMENT

There are numerous grazing systems that a land manager or rancher may consider to balance grazing impacts with time and space. These systems include continuous grazing, seasonal grazing, rotational grazing and high density-short duration grazing as practiced through **HRM** (Holistic Resource Management). To read entire article: http://ucanr.edu/pub8529



University of California
Agriculture and Natural Resources

ANR Publication 8529 | August 2015
http://anrcatalog.ucanr.edu

Photo: runnaway/Flickr

UNDERSTANDING WORKING RANGELANDS

Grazing Systems Management

Achieving Management Goals by Balancing Livestock Grazing with Time and Space

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The earliest grazing systems date back to the domestication of livestock. Nomadic herdsmen moved livestock from one range site to another, probably following the patterns of forage quality and quantity and the availability of water. Grazing systems became more structured, employing fencing and developed water, over 500 years ago in Europe, when human population pressures demanded greater productivity from agricultural land.

Early ranchers in North America herded or turned livestock loose across open range. Without fences and with natural sources of water found only in limited locations, livestock moved from one site to the next based on the availability of forage and water. The invention of barbed wire in the late 1800s led to better control of livestock and the development of grazing systems in North America. Specialized grazing systems, such as rotation of grazing between pastures, were first conceptualized before the turn of the twentieth century (Smith 1895) and became a focus of range researchers and managers

Photo: Lawrence Ford

Working rangelands are public or privately owned open space lands that are managed with livestock grazing and rancher stewardship. Their management contributes to the production of a variety of ecosystem services, including: food, clean water, weed control, wildlife habitat, fire fuel reduction, carbon sequestration, pollination, aesthetic views, cultural heritage, recreational and educational opportunities, and open space conservation.

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Public Workshop on Tree Mortality in Santa Clara County

WHEN: **October 15, 2016**
9 a.m. - 4 p.m.

WHERE: **Morning/Inside at: West Valley College, 14000 Fruitvale Avenue, Saratoga, Fox Center (see attached map - zoom for detail; parking in Lot 5)**

Afternoon/Outside at: Sanborn County Park

Tree mortality due to the extended drought, disease and insect attack is a state-wide issue that warranted the Governor's proclamation of a State of Emergency in 2015. Although the emergency proclamation applies to the Sierra Nevada, there has been extensive mortality elsewhere in the state due to various causes. The acknowledgement of increased mortality of hardwood and conifer trees in Santa Clara County created the impetus to hold this workshop. The workshop is directed at public, non-governmental and private landowners who have experienced tree mortality on their properties and/or are concerned about its potential effects. It is intended to inform landowners who need to know how to diagnose potential problems and if possible, take steps to reduce their risk.

The workshop will present information on the extent of tree mortality in Santa Clara County and the species that have been and will continue to be affected by it. It will describe the agents of mortality involved and provide guidance on diagnosing and preventing problems. Organizations that are addressing mortality on their lands will describe their efforts. Panelists will provide information on technical and financial assistance available to landowners for eliminating dead and diseased trees and/or preventing the spread of mortality agents. The workshop is open to all and it will include a combination of indoor presentations and a field trip. The Northern California Society of American Foresters, California Department of Forestry and Fire Protection, Guadalupe-Coyote and Loma Prieta Resource Conservation Districts, Pacific Gas and Electric Company, Santa Clara County Parks Department, Santa Clara Valley Open Space Authority, West Valley College, City of Saratoga and Santa Clara Valley Habitat Agency are sponsoring the workshop

Agenda (subject to change**)**

0900: Welcome – Introductions - Housekeeping

Bill Taylor, West Valley College
Dr. Richard Harris, Northern California Society of American Foresters
Edgar Orre, California Department of Forestry and Fire Protection

0915: Tree Mortality in Santa Clara County
Edgar Orre, California Department of Forestry and Fire Protection

0945: Mortality Agents Affecting Native Hardwoods
Kathy Kosta, California Department of Food and Agriculture

1015: Break

10:30: Mortality Agents Affecting Native Conifers
Tom Smith, California Department of Forestry and Fire Protection

1100: Controlling the Introduction and Spread of Mortality Agents
Kathy Kosta, California Department of Food and Agriculture

1130: Panel Discussion: Addressing Mortality
Santa Clara County Parks Department, Pacific Gas and Electric Company, California Department of Forestry and Fire Protection

1200: Panel Discussion: Technical and Financial Assistance Available to Landowners
Guadalupe-Coyote Resource Conservation District, California Department of Forestry and Fire Protection, Santa Clara County Firesafe Council

1230: Depart for field –

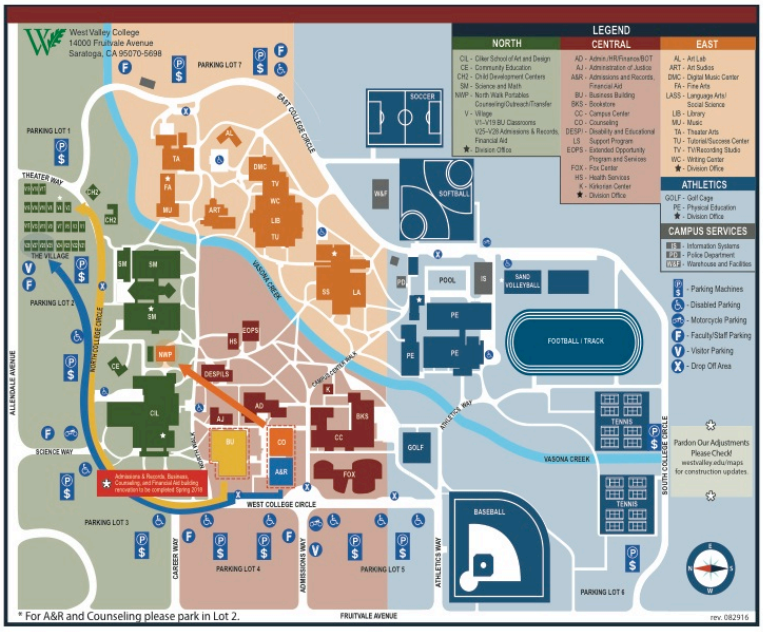
1300: Diagnosing Tree Disease and Insect Problems in the Field

1600: Adjourn & Safe Travels

Logistics:
Transportation from the conference site to the field site will be the responsibility of attendees. Car-pooling will be encouraged. You should come prepared for a full day and bring your lunch and water. We will eat en route or in the field. Dress appropriately for the afternoon field session in the woods.

This Forest Stewardship Education program is supported in part by a grant from USDA Forest Service State & Private Forestry

The workshop is free of charge but registration is mandatory. To register for the workshop sign up at https://treemortalitysantaclara.eventbrite.com. Contact Dr. Richard Harris at forestryhelp@gmail.com or calling (707) 685-5508 if you have any questions about the workshop.



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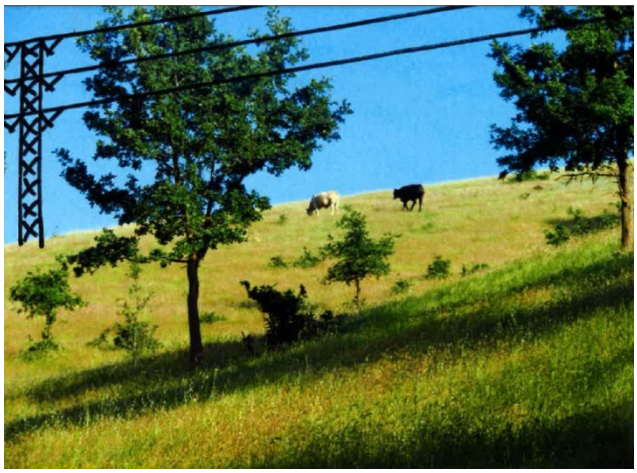
Do Cows Use Compasses?



Many animals from insects to reptiles to mammals use the magnetic field of the earth for navigation and directional orientation. Cows are no exception. Researchers have observed cattle aligning their bodies while grazing and resting in the geomagnetic North-South direction. Other explanations such as wind, shade, and slope did not explain the cows' alignment because these factors were not consistent from site to site. The researchers were also able to confirm their finding because they discovered that high-voltage power lines impacted the cows' ability align in the common North-South direction. Cows grazing or resting under high-voltage power lines aligned in distinct patterns in various magnetic directions depending on their proximity to the lines.
The researchers speculated that the cow's use of magnetic fields for alignment may help individuals to synchronize with their herd for more effective grazing or to be more effective against predators.

Burda, H., S. Begali, J. Cervey, J. Neef, and P. Nemec. 2009. Extremely low-frequency electromagnetic fields disrupt magnetic alignment of ruminants. Proceedings of the National Academy of Science.

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For newsletter archives, please visit:
http://ucanr.edu/range_newsletter

This newsletter is provided by the UC Cooperative Extension Natural Resources Program in the San Francisco Bay Area and provides information to managers of both public and private rangelands. RANGELAND, which is land characterized by natural vegetation i.e., grass, forbs and shrubs and managed as a natural ecosystem, is the predominate source of OPEN SPACE in the San Francisco Bay Area.

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