Keeping Landscapes Working

A Newsletter for Managers of Bay Area Rangelands

Volume 1, Issue 4 | University of California Cooperative Extension | Fall, 2004

Sheila Barry
Natural Resources
Advisor
UCCE Santa Clara County
1553 Berger Drive
San Jose, CA 95112
(408) 282-3106
sbarry@ucdavis.edu

A newsletter provided by the UC Cooperative Extension Natural Resources Program in the San Francisco Bay Area. This newsletter 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 predominant source of OPEN SPACE in the San Francisco Bay Area.

Sheila Barry, UCCE Bay Area Natural Resources Advisor

In This Issue

Keeping Landscapes Working is published through the cooperative efforts of the University of California's SantaClara County Cooperative Extension Service and the County of Santa Clara.

Rangeland Water Quality Research and Practices

The watersheds of the San Francisco Bay Area, which provide for municipal water needs, are largely comprised of rangeland. Although the majority of this land is in private ownership, numerous federal, state and local public entities own and manage rangeland in the San Francisco Bay Area. Grazing on public lands throughout the San Francisco Bay Area is key to maintaining the viability of the area's remaining agriculture, conserving its open space, maintaining and improving wildlife habitat, as well as protecting its watershed lands. Although there is concern about the impact of grazing on water quality, research such as the research reported in this issue of *Keeping Landscapes Working*, indicates that well-managed grazing can not only be compatible with maintaining high water quality but also may work to maintain water yield, while reducing flood hazards.

Cattle Impact on Stream Channels

Based on research reported by Melvin R. George, Royce E. Larsen, Neil K. McDougald, Kenneth W. Tate, John D. Gerlach, Jr. and Kenneth O. Fulgham. 2004. *Cattle grazing has varying impacts on stream-channel erosion in oak woodlands* . California Agriculture 58:3: 138-143.
For full article see: http://CaliforniaAgriculture.ucop.edu

University of California researchers conducted a 5-year study on the impact of grazing on stream-channel bare ground and erosion, and a 3-year study of cattle-trail erosion on intermittent stream channels draining grazed oak-woodland watersheds. While concentrating cattle along stream banks during the dry season resulted in a significant increase in bare ground compared to other grazing treatments or the ungrazed control, researchers were unable to detect stream-bank erosion resulting from any of the treatments. However, researchers did find that cattle trails near stream crossings are an important mode of sediment transport into stream channels.

These results indicate that practices causing cattle to congregate near stream channels during the dry season can significantly decrease groundcover. However, the streams in this study were intermittent, and like many streams across California's annual grasslands, they are not very attractive to cattle during the dry season. The intensity of

Continued on p. 2

Cattle Impact, continued from cover

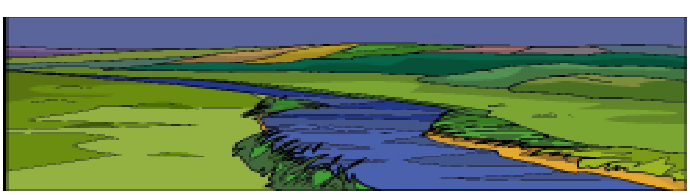
grazing and trampling similar to the concentrated grazing treatment used in this study is unlikely to occur under proper stocking rates and grazing practices.

As previously noted there was no significant stream-bank erosion detected between grazed and ungrazed treatments averaged across all study years. However, stream-channel depth changed significantly from year to year, reflecting the seasonal and annual movement of bedload along the stream channel bottom. The greatest between-year change was from 1996 to 1997- an above average rainfall year- resulting in higher-than-normal flow events.

While cattle-trail crossings affect a very small length of the channel within a watershed, the results of this study suggest that trails can be an important, management –caused conduit of sediment. In the years of study where there was sufficient rainfall to generate measurable runoff (two of the three study years) sediment transport as measured in sediment traps was significantly greater from the cattle trail and from the nearby vegetated area.

Management Implications. Terminating grazing programs and fencing are certain methods to reduce livestock impact on stream channels and water quality. However, less restrictive management changes such as strategic placement of water sources and supplemental feeding away from critical area may produce similar water quality protection results, while maintaining the use of grazing to manage wildlife habitat, fire fuel loads and weed infestations.

Trailing can also be controlled with appropriate management practices. Excessive trailing is generally an indication that stock watering points are too far apart. Stock-water development and/or strategic placement of fencing can improve significantly reduce trailing. These rangeland improvements should receive high priority in the allocation of agency conservation and pollution-control funding.



Public Agencies in the SF Bay Area that Use Grazing Livestock as a Land Management Tool

United States Fish and Wildlife Service
United States Department of Defense, Naval Weapons Station
California State Parks and Recreation
California Department of Water Resources
California Department of Fish and Game
East Bay Regional Park District
East Bay Municipal Utility District
San Francisco Public Utilities Commission
Contra Costa Water District
Santa Clara Open Space Authority
Santa Clara County Parks
Peninsula Open Space Trust
Muir Heritage Land Trust
Mid-Peninsula Regional Open Space District
Alameda County Waste Management Authority
Livermore Area Recreation and Park District
Hayward Area Recreation and Park District
City of Fremont
Town of Moraga
City of San Ramon
City of Walnut Creek

Spring-fed Wetlands Research and Guidelines

Based on research by Barbara Allen-Diaz, Randall D. Jackson, James W. Bartolome, Kenneth W. Tate and Lawrence G. Oates. 2004. *Long-term grazing study in spring-fed wetlands reveals management tradeoffs.* California Agriculture 58:3: 144-153. For full article see: http://CaliforniaAgriculture.ucop.edu

University of California researchers used 10-year (long-term) and 3-year (paired-plot) experiments to better understand grazing management effects of spring-fed wetlands. They studied spring ecosystem responses in plant composition, diversity and cover; channel morphology; water quality; aquatic insects; and green-house gases.

Spring-fed wetlands are small, patch ecosystems found throughout California's oak woodlands and annual grasslands. They are important in overall landscape structure and function in a way that is disproportionate to their size. Much of the water exiting California oak woodland watersheds passes through these highly productive spring-riparian zones, which are located at the interface of the terrestrial- aquatic ecosystem. The researchers found that wetland vegetation in these systems, typically cattails, sedges, rushes and perennial grasses, act as nutrient filters for waters emerging at the soil surface.

High herbaceous plant production is one of the key factors for maintaining ecosystem services, by promoting carbon sequestration and nutrient conservation from the terrestrial landscape. A factor such as grazing, which influences ecosystem productivity, is an important control. Livestock grazing shapes plant communities in these systems. This study found that nutrients (nitrogen) from the surrounding environment flow into the spring systems, supporting great productivity in concert with water and energy surpluses. Removal of livestock grazing resulted in increased levels of nitrate in wetland waters and a higher level of nitrate pollution compared to grazed springs. Grazing removal also resulted in change in plant composition in terms of decreased plant diversity. Some degree of grazing is desirable from an ecosystem function perspective, although consistently high grazing intensity will reduce herbaceous cover to undesirable levels.

Future work on spring-fed wetland should examine grazing interactions with greenhouse gases. While this study found that nitrate levels in spring water increased and preliminary data showed that greenhouse gas nitrous oxide also increased, grazing exclusion resulted in a decrease of methane gas production.

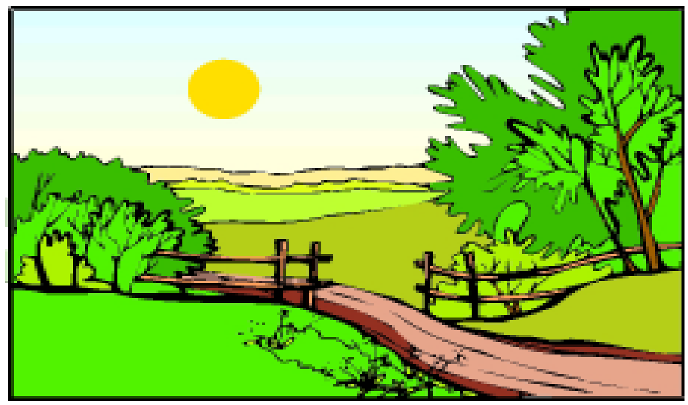
Survey identifies sediment sources in North Coast rangelands

Based on research by David J. Lewis Kenneth W. Tate John M. Harper Julie Price. 2001.

UC researchers conducted a sediment source survey to gain insight into soil erosion on Northern California rangeland watersheds and to provide information to facilitate informed land-use management, conservation prioritization and water-quality regulation decisions.

The results indicate that by focusing on erosion associated with natural and historical influences, inventory and assessment efforts on these watersheds can characterize the majority of sediment deliverable to streams. While this volume of sediment does not require mitigation under current water-quality regulations, it nonetheless prohibits the ability of instream sediment monitoring to detect water-quality changes. Water quality regulations require managers to create inventories for all sources with 10 cubic yards or more of potentially deliverable sediment. If a monitoring threshold of 100 cubic yards was used, more than 99% of the deliverable sediment identified in this survey would be inventoried. This would require developing inventories for only 82 of the 117 sites in this study. Overall, the researchers determined that rangeland managers can achieve the greatest reductions in sediment generation by focusing on erosion from roads.

For the full article see: http://californiaagriculture.ucop.edu/0104JA/pdfs/sediment.pdf



Minimize sheet, rill and gully erosion from unpaved roads

By Sheila Barry adapted from Guenter, Keith. 1999. Low Maintenance Roads. Wildland Solutions.

Roads can not only be a source of erosion but improper design to control runoff from roads can lead to additional erosion problems like landslides and gullies. Efforts to reduce erosion in the watershed should focus on design and maintain low-maintenance unpaved roads, using the following principles:

√ *Hillslope Location.* Roads are best located on hillslopes of 10-40%. Road located on hillslopes of 0-10% or 40-55% may require extra attention to control drainage and potential bank failure.

√ *Outsloped.* Where appropriate, roads should be outsloped 4-8%, with outslope being 1-2% greater

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Watershed Research:

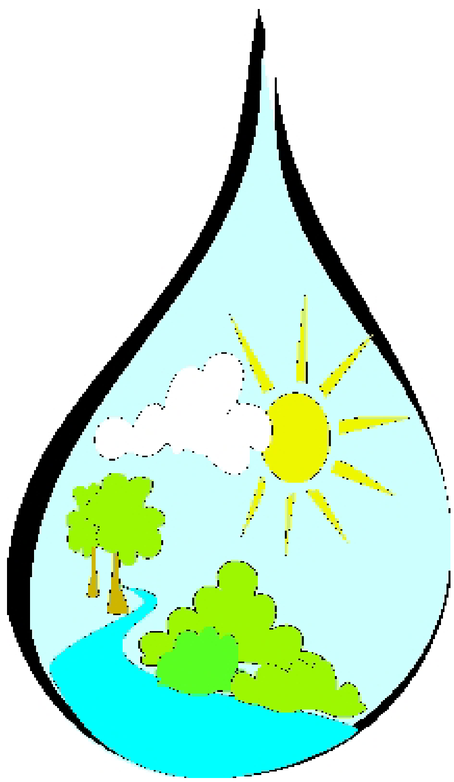
Vegetation Effects on Water Yield

Adapted from Dahlgren, R.A. et al. 2001. Watershed research examines rangeland management effects on water quality. California Agriculture 55:6:64-71. http://californiaagriculture.ucop.edu/0106ND/pdfs/watershed1771.pdf

Vegetation affects the hydrologic cycle through evapotranspiration and the interception of water. Both processes are a direct function of the type and density of vegetation present in the watershed. On one hand native vegetation in California is being lost due to housing development, conversion to agricultural crops, sudden oak death syndrome and the death of oaks from wildfire. On the other hand, undistributed grasslands are reverting to woody vegetation. What do these changes in vegetation type and density mean in terms of watershed function?

Beginning in the early 1950's, a series of watershed studies was undertaken on experimental watersheds at the Hopland Research and Extension Center in Mendocino County. The watersheds ranged from 30 to 210 acres. All have relatively steep slopes, from 20 to 60%. The climate at Hopland is Mediterranean, with a mean annual precipitation of 37 inches and a mean annual temperature of 57° F. Soils in the watersheds are moderately developed and shallow, rarely exceeding 3 to 4 feet deep.

In 1952, Watershed I (63 acres) and Watershed II (210 acres) were fitted with instruments, including precipitation gauges, stream runoff measuring stations and debris basins for sediment transport measurements. Both watersheds were located at lower elevations (500 to 1,000 ft) with typical oak woodland vegetation. Baseline data was collected for several years.



In 1956 vegetation from Watershed I was mechanically removed, followed by burning of woody materials, treatment of stumps with herbicide and seeding with a grass-legume mixture. Between 1960 and 1965, vegetation in Watershed II was killed with herbicide. Dead trees were left in place. In 1965, Watershed II was burned and reseeded with a grass-legume mixture. Vegetation, stream flow and sediment data were collected from both Watershed I and II for over a decade following vegetation conversion on each watershed.

Vegetation and Water Yield Findings

The researchers found that converting woodlands to grass vegetation retarded runoff during storms, and resulted in nearly a doubling in the length of storm hydrographs from both watersheds. (Hydrographs plot the flow or discharge of a waterway through time.) After conversion to grass vegetation, peak runoff rates were reduced by about 25% compared to pretreatment storms. This result is different from that realized in other studies conducted in other woodland and forest systems elsewhere in the world.

The longer hydrograph responses indicated a longer, slower period of runoff with greater contribution of water from subsurface flows. These changes resulted from an increase in grass cover that retarded overland flow and permitted more opportunities for infiltration. The removal of the deep-rooted trees also resulted in a long-term increase in runoff and an extension of base flow through the dry season. After vegetation was converted, intermittent streams became perennial in both Watershed I and II.

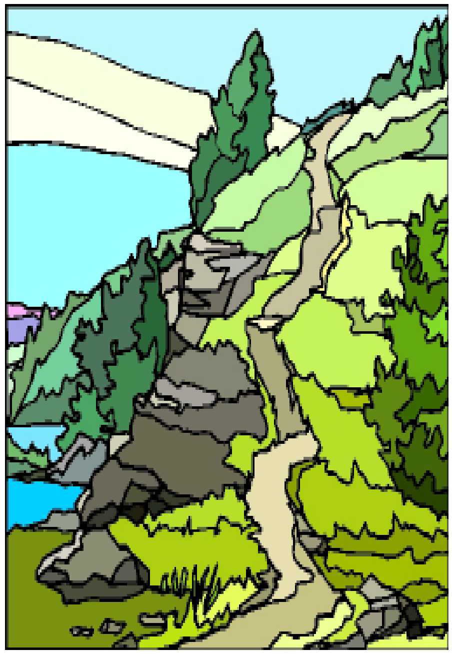
After conversion to grassland in these watersheds, stream discharge increased by an average of 60%. In pre and post treatment condition, however, there was a high correlation between runoff and total precipitation.

There was also a seasonal affect that should be considered. March was the critical month in the runoff process. During the rainy period leading up to March, the increase of water yield in the converted watersheds was definite. During March, the effect of conversion was variable, sometime positive and sometimes negative.

This behavior may be explained by examining the growth patterns of grasses and oak vegetation. At the experimental site in Mendocino County, warm temperatures in March promote the growth of grasses, resulting in increased evapotranspiration. In contrast, deciduous oak trees are not in full leaf in March, resulting in less water loss to interception and evaportranspiration. Rainfall in April and May often produces no runoff due to high evapotranspiration demands, especially after deciduous trees leaf out.

These experimental results have important ramifications for vegetation and land use throughout the California Coastal Range. Decreased peak flows during storms and reduced flood hazards may be among the benefits of maintaining grasslands and preventing the encroachment of woody species.

The increase annual water yield including the increase in summer and fall base flows may have



important benefits for anadramous fish species and the health and integrity of the aquatic ecosystem. Similarly, the change in ephemeral streams to perennial streams may improve wildlife habitat by providing a summer source of water.

It should be noted that with these increased stream flows in the converted watersheds came significant erosion problems. Although a lot of the mass-wasting events observed after the conversion treatment were associated with tree and shrub root, the loss of root systems in providing reinforcement and the increase in soil-moisture were also factors. In any case, given needs for water quality and quantity careful consideration should be given to managing and maintaining the type of vegetation that produces desired results.

Questions watershed land managers might consider include:

1) How does the watershed's hydrograph change with the invasion of deep-rooted invasive species i.e. Yellow Starthistle, Harding grass?

2) How does 500 lbs versus 1000 lbs of residual dry matter effect water quality and quantity?

3) How does 1000 lbs versus 3000 lbs of residual dry matter effect water quality and quantity?

4) How does encroachment of brush into grasslands effect water yield?

5) How does mechanical brush removal or prescribed fire on brushlands impact water quality?

Minimize erosion, continued from p. 3

than the slope of the road grade. Outsloping should be avoided where the road surface is composed of fine, highly erodible soil or on well-traveled curves. Outsloping of 4-season roads should be carefully designed and planned to maximize safe driving conditions.

√ *Road Grade*. Roads should have a gradient of 2- 8%. Lengthening the road with switchbacks and/or climbing turns will minimize road grade up steep hills. Roads with gradients of 9-12% can be accommodated for short distances but will require attention to drainage.

√ *Road Surface.* Consider surface treatment to problem wet spots. Seep sites should be protected with a gravel road base placed over a layer of filter fabric to prevent the gravel from mixing with the mud. Underground drains may also be needed to remove water

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Minimize erosion, contimued from p. 5

from the roadway.

√ *Weed Control.* Consider where practical, mowing rather than blading or grading roadways.

√ *Rolling* Dips. Install rolling dips when a natural drainage feature is crossed and where necessary to prevent water from accumulating on the roadway. Rolling dips should be at least 12" below grade and have a 15-25 foot approach on the down-hill side.

Monitoring and Corrective Actions: Prior to grading, evaluate road sections for channels and ruts as well as road failure. Note sections of road that require extra maintenance. On road sections that fail or require extra maintenance, opportunities to provide for additional drainage should be identified. If the road does not follow the basic design principles for low-maintenance unpaved roads, the landowner should consider relocating the road.

Record Keeping: Roads should be mapped on property maps with problem spots identified. Additional records of road maintenance work should be kept.

WEST NILE WATCH 2

DEAD BIRD DISTRIBUTION for 2004

September 2004
Scott, Tom. UC Cooperative Extension
Wildlife Specialist, Riverside .

As of 23 August, about 65,000 dead birds have been reported to the California Department of Health Services West Nile Virus Hotline. Callers have reported dead birds from over 1500 communities. Highest densities of dead birds have been reported from seven areas (number of birds in parenthesis).

Santa Ana Watershed, Riverside and San Bernardino Counties (12000)
San Fernando Valley, Los Angeles County (7800)
San Gabriel Valley, Los Angeles County (6800)
Southern and central Los Angeles (5500)
San Francisco Bay Area, Contra Costa and Alameda Counties (2200)
Fresno and Kern Counties (2050)
Upper Sacramento River Basin (2000)

The first concentrations of dead bird reports (in 2004) began in the San Gabriel Valley in the first week of May, followed by die-offs around the Santa Ana River basin in the third week of May. Over the month of June, dead bird reports began to concentrate in the San Fernando Valley and Los Angeles areas. In early July, concentrations of dead birds were reported from the Southern and Central Great Valleys. By the third week of July, concentrations of dead bird were reported in the East Bay, San Francisco Peninsula communities, and the west side of the Central Sierras – as far east as South Lake Tahoe. By the last week of July, dead bird concentrations were reported from the Northern Great Valley – as far north as Redding.

Prior to the third week of July, it appeared that the northern and southern edges of the die-off could be approximated. However, the recent detection of the West Nile Virus along the southern end of the Sierra Nevada Mountains, and the rapid spread through the northern half of the states suggests that only a southern edge of the die-off remains (San Diego County). Given the suspicious concentrations in Northern San Diego County it is unlikely that any region of California will be uninfected by West Nile Virus by early September. That said, there are still variations in concentrations and differences in the time duration of dead bird hotspots, so it is still vitally important that you continue to call the West Nile Virus Hotline at 1-877-968-2473 with information on dead birds.

SPECIES SUMMARY

More than half of the dead birds reports are for American Crows (65%; 37,500). Most of the American crow records (88%) are from Los Angeles (19,300), San Bernardino (7400), Riverside (4300), and Orange (2300) Counties. Other species are listed below in order of prominence in dead bird reports. At least 120 species have been reported by standard name (American Ornithologist Union); however, many species are reported by group, such as “hawks”, “owls”, and “hummingbirds”. The US Center for Disease Control and the US Geological Survey maintain web-pages (REF) on birds affected by WNV. An exceptionally large number of species found dead with WNV or antibodies for the disease present.

At least 20% of the dead bird records were not identified to species: of these records, two thirds were not identified to any taxonomic group. Species represented by more than five records are reported in the Table A.

UCCE Santa Clara Address Change

The University of California Cooperative Extension office is now at1553 Berger Drive, Building 1, the site of many county offices. The new address is 1553 Berger Dr., San Jose, CA 95112.

Phone: (408) 282-3106

Directions: from 880 – take the Gish Rd exit, turn left onto Gish at the bottom of the ramp, cross the tracks and turn left onto Berger Dr. From 101- take the 13th Ave/ Oakland Rd. exit, go east on Oakland Rd., turn left onto Berger Dr.

TABLE A. Species reported to the California Department of Health Services West Nile Virus Hotline (1 January to 23 August 2004).

Grand Total	66076
Unknown	7787
American Crow	37513
House Sparrow	4484
Western Scrub-jay	3869
Mourning Dove	1314
Yellow-billed Magpie	1235
House Finch	1081
Common Raven	1021
Stellers Jay	782
Brewers Blackbird	721
American Robin	415
Northern Mockingbird	271
European Starling	171
Barn Owl	131
Domestic Chicken	129
Red-shouldered Hawk	82
Coopers Hawk	63
Red-tailed hawk	49
Turkey Vulture	42
Red-winged blackbird	39
Mallard	29
California Tohwee	25
California Brown Pelican	23
Band-tailed Pigeon	20
Great Horned Owl	19
American Kestrel	18
Northern Flicker	18
Cedar Waxwing	16
Acorn Woodpecker	12
Lesser Goldfinch	12
Ring-neck Dove	12
Common Pigeon	11
Black-headed Grosbeak	9
Great-tailed Grackle	9
Snowy Egret	9
Western Meadowlark	9
California Quail	7
Greater Roadrunner	7
Black Phoebe	6
Pine Siskin	6
Song Sparrow	6
Western Tanager	6
Sharp-shinned Hawk	5
Western Bluebird	5

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Santa Clara County
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